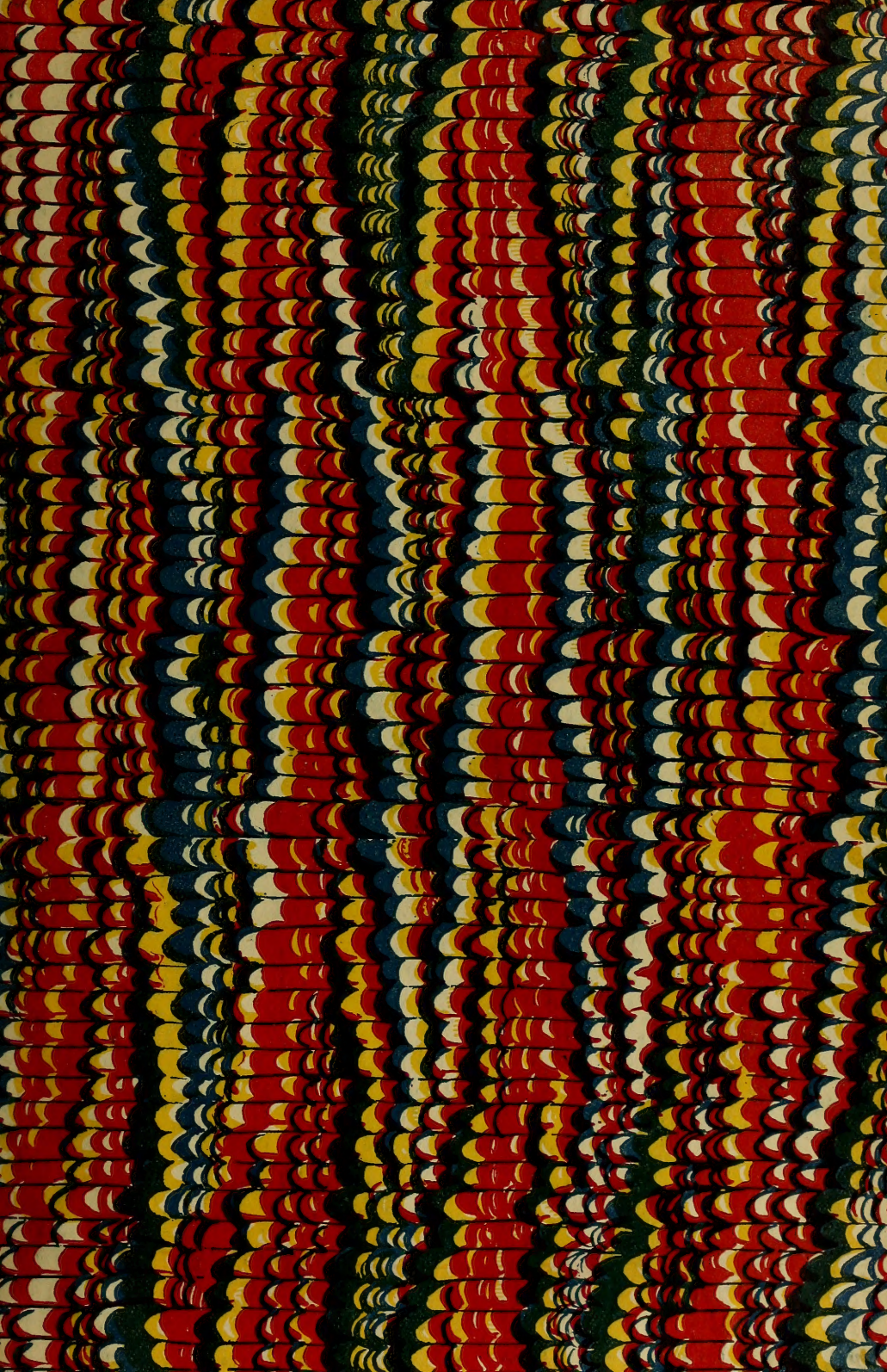




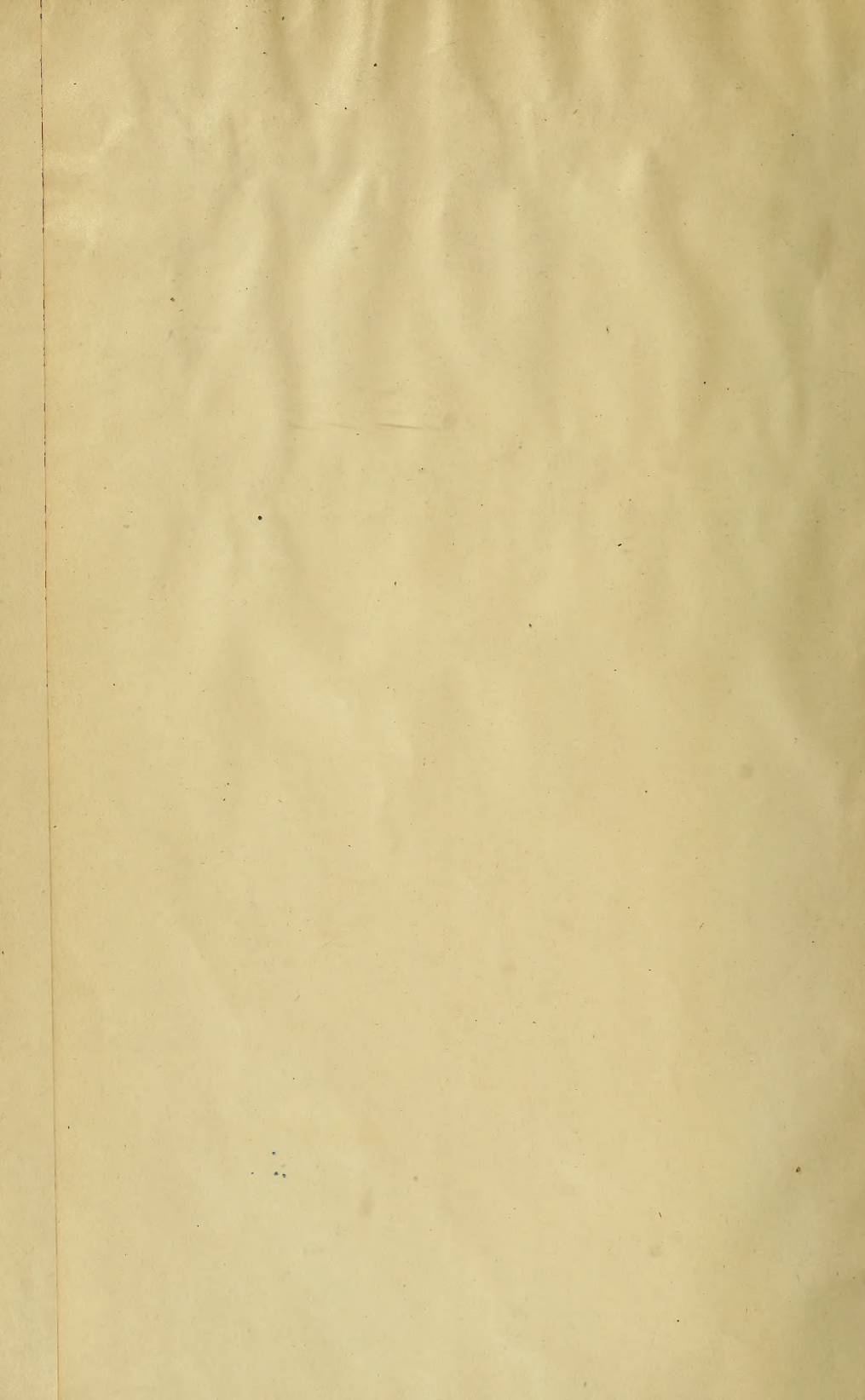


1. Descriptions of the Alcyonaria Collected by the U. S. Bureau of Fisheries Steamer Albatross in the Vicinity of the Hawaiian Islands in 1902.

Proc. U. S. Nat. Mus., Vol. XXXIV, No. 1624,
pp. 543-601, pls. XLI-LI. 1908.

2. Alcyonaria of the Californian Coast.

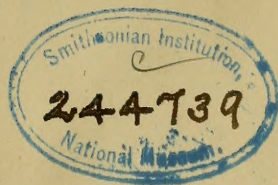
Proc. U. S. Nat. Mus., Vol. XXXV, No. 1658,
pp. 681-727, pls. LXXXIV-XCI. 1909.

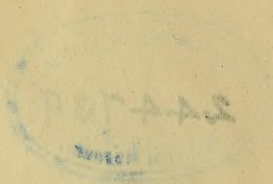


5 Mar. Invert

Nutting, Charles C.

Pacific Alcyonaria. (Binder's title).





DESCRIPTIONS OF THE ALCYONARIA COL-
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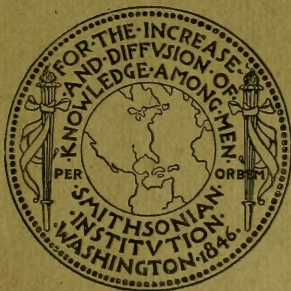
BY

CHARLES C. NUTTING

Professor of Zoology, State University of Iowa, Iowa City

No. 1624.—From the Proceedings of the United States National Museum,
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INTRODUCTION.

The Hawaiian region appears to be a virgin field, so far as Alcyonaria are concerned, as the writer has been unable to find a single reference, in the rather extensive literature consulted, indicating that any alcyonarians whatever have been reported from this region.

This fact, together with the extraordinary isolation of these islands from any large land mass, makes the material discussed in the following report of unusual interest, both from the number of new forms included and from the standpoint of zoögeography.

Considering the length of time since the discovery of the Hawaiian Islands, and the number of European and American residents and visitors, it is somewhat surprising that nothing has heretofore been reported regarding the very rich alcyonarian fauna. This is doubtless due, in part, to the fact that this group of animals has but little recognized economic importance, and more particularly to the almost total lack of dredging operations in this region. A few hauls, it is true, were taken by the *Challenger* in the vicinity of the Hawaiian group, but there is no mention of any Alcyonaria being secured.

Of the 68 species brought to light by the cruise of the U. S. Bureau of Fisheries steamer *Albatross* in 1902, 39 are new and 29 have been reported from other localities, giving a proportion of 57 per cent of new species. Of the three orders of Alcyonaria discussed, the first, the Alcyonacea is most meagerly represented by 5 species. The second order, the Pennatulacea, is well represented by 16 species, while the remaining 47 species belong, as would be expected, to the great and widely distributed order Gorgonacea.

The paucity of Alcyonacea was to be expected from the fact that this order is largely arctic in its distribution, although certain special groups are very abundant in the Australian region. It is interesting

to note in this connection that the strong infusion of arctic forms found in reporting on the Hydroida of the Hawaiian region^a is not to be found in the alcyonarian fauna. The Pennatulacea is a group mainly found in deep water in all seas, and its occurrence in this collection was to be expected, although the number of new species is rather larger than might have been anticipated. The most notable fact in regard to the Gorgonacea is the entire absence of representatives of the great family Gorgonidæ, the scarcity of the Briareidæ, and the surprisingly rich representation of the Primnoidæ, and particularly of the Chrysogorgidæ, which leads the list of families with 17 species, exactly one-fourth of all the species found, 9 of which are new.

In order to show the general facies of the alcyonarian fauna of the Hawaiian region the following synopsis is presented:

SYSTEMATIC SYNOPSIS OF THE HAWAIIAN ALCYONARIA.

Order ALCYONACEA.

Family CORNULARIDÆ.

Clavularia spiculicola, new species.

Clavularia corrugata, new species.

Family ALCYONIDÆ.

Anthomastus steenstrupi Wright and Studer.

Family NEPHTHYIDÆ.

Spongodes alexanderi, new species.

Siphonogorgia collaris, new species.

Order PENNATULACEA.

Family PENNATULIDÆ.

Pennatula sanguinea, new species.

Pennatula flava, new species.

Pennatula pallida, new species.

Pennatula pearceyi K  lliker.

Halisceptrum abies K  lliker.

Family ECHINOPTILIDÆ.

Echinoptilum macintoshi Hubrecht.

Family ANTHOPTILIDÆ.

Anthoptilum murrayi K  lliker.

^a Hydroids of the Hawaiian Islands collected by the steamer Albatross in 1902, by C. C. Nutting, Bulletin U. S. Fish Commission, 1903, Part 3, p. 935.

Family KOPHOBELEMNONIDÆ.

Calibelemon symmetricum, new species.

Family UMBELLULIDÆ.

Umbellula carpenteri Kölliker.

Umbellula jordani, new species.

Umbellula gilberti, new species.

Umbellula, species.

Family PROTOCAULIDÆ.

Protocaulon molle Kölliker.

Family PROTOPTILIDÆ.

Protoptilum wrighti, new species.

Trichoptilum attenuatum, new species.

Cladiscus studeri, new species.

Order GORGONACEA.

Family BRIAREIDÆ.

Paragorgia nodosa Koren and Danielssen.

Family SCLEROGORGIDÆ.

Keroeides gracilis Whitelegge.

Family ISIDÆ.

Ceratoisis flabellum, new species.

Ceratoisis paucispinosa Wright and Studer.

Ceratoisis grandis, new species.

Lepidisis longiflora Verrill.

Acanella eburnea (Pourtalès).

Family PRIMNOIDÆ.

Amphilaphis biserialis, new species.

Amphilaphis regularis Wright and Studer.

Caligorgia gilberti, new species.

Stenella helminthophora, new species.

Stachyodes angularis, new species.

Stachyodes regularis Wright and Studer.

Stachyodes dichotoma Versluys.

Stachyodes bowersi, new species.

Calyptrophora japonica Gray.

Calyptrophora wyvilli Percival Wright.

Calyptrophora versluysi, new species.

Family MURICEIDÆ.

- Acanthogorgia armata* Verrill.
Paramuricea æquatorialis Wright and Studer.
Paramuricea hawaiiensis, new species.
Anthomuricea tenuispina, new species.
Clematissa alba, new species.
Clematissa tenue, new species.
Clematissa verrilli Wright and Studer.
Menella grandiflora, new species.
Echinomuricea brunnea, new species.
Cyclomuricea flabellata, new species.
Muricella tenera Ridley.

Family CHRYSOGORGIDÆ.

- Lepidogorgia gibbosa*, new species.
Lepidogorgia spiralis, new species.
Chrysogorgia arborescens, new species.
Chrysogorgia delicata, new species.
Chrysogorgia elegans (Verrill).
Chrysogorgia flexilis (Wright and Studer).
Chrysogorgia lata Versluys.
Chrysogorgia spiculosa (Verrill).
Chrysogorgia curvata Versluys.
Chrysogorgia flavescens, new species.
Chrysogorgia geniculata (Wright and Studer).
Chrysogorgia stellata, new species.
Metalllogorgia melanotrichos (Wright and Studer).
Metalllogorgia squarrosa (Wright and Studer).
Iridogorgia bella, new species.
Iridogorgia superba, new species.
Pleurogorgia militaris, new species.

Family GORGONELLIDÆ.

- Verrucella bicolor*, new species.

The synopsis given above shows that the 68 species of alcyonarians now known from the Hawaiian Islands are distributed among 17 families and 38 genera.

DISTRIBUTION.

Our knowledge of the Alcyonaria as a whole is far too incomplete to warrant us in being dogmatic in our conclusions regarding their general distribution, either geographic or bathymetric. When we consider how little of the ocean bottom has been explored with any thoroughness, and the vast extent of practically unknown regions, and the host of species yet to be discovered, it becomes evident that our conclusions are tentative at best, and very likely to be rendered valueless by further exploration and study. The ocean floor has been but scratched here and there by the dredge and trawl, and the absence of species from our collections will by no means warrant us in saying that they are really absent from the regions explored.

There remains, however, a positive value to the record of species actually secured, and the correlation of the work of students in different groups is now yielding results of recognized importance.

Geographical and bathymetrical distribution of Hawaiian Alcyonaria.

Name.	China and Japan.	Pacific.		Atlantic.		Bathymetric (in fathoms).
		East Indies.	South Pacific.	North Atlantic and West Indies.	South Atlantic.	
* <i>Clavularia spiculicola</i>						283-337
* <i>Clavularia corrugata</i>						500
<i>Anthomastus steenstrupi</i>	+					122-565
* <i>Spongodes alexanderi</i>						122-155
* <i>Siphonogorgia collaris</i>						79
* <i>Pennatula sanguinea</i>						194-565
* <i>Pennatula flava</i>						122-173
* <i>Pennatula pallida</i>	+					220-290
<i>Pennatula pearceyi</i>						565
<i>Halisceptrum abies</i>	+					122
<i>Echinoptilum macintoshii</i>	+					123-127
<i>Anthoptilum murrayi</i>				+		233-1,250
* <i>Calibelemon symmetricum</i>						84-697
* <i>Umbellula carpenteri</i>	+					572-1,124
* <i>Umbellula jordani</i>						385-1,314
* <i>Umbellula gilberti</i>						387-1,067
* <i>Umbellula</i> , species.....						
<i>Protocaulon molle</i>			+			692-700
* <i>Protoptilum wrighti</i>						286
* <i>Trichoptilum attenuatum</i>						506
* <i>Cladiscus studeri</i>						53-230
<i>Paragorgia nodosa</i>				+		300-438
<i>Keroeides gracilis</i>		+				134-212
* <i>Ceratoisais flabellum</i>						190-228
<i>Ceratoisais paucispinosa</i>	+					295-345
* <i>Ceratoisais grandis</i>				+		735-865
<i>Lepidisis longiflora</i>						561-805
<i>Acanella eburnea</i>				+		251-955
* <i>Amphilaphis biserialis</i>						240
<i>Amphilaphis regularis</i>	+				+	100-395
* <i>Caligorgia gilberti</i>						225-528
* <i>Stenella helminthophora</i>						21-1,000
* <i>Stachyodes angularis</i>						660-1,800
<i>Stachyodes regularis</i>		+				(?)
<i>Stachyodes dichotoma</i>		+				105-957
* <i>Stachyodes bowersi</i>		+				735-1,059
<i>Calyptrophora japonica</i>	+	+				136-1,301
<i>Calyptrophora wyvilli</i>		+				540-1,800
* <i>Calyptrophora versluysi</i>						429-557
<i>Acanthogorgia armata</i>				+		304-1,000
<i>Paramuricea equatorialis</i>					+	80
* <i>Paramuricea hawaiiensis</i>						502-508
* <i>Anthomuricea tenuispina</i>						143
* <i>Clematissa alba</i>						762-1,000
* <i>Clematissa tenue</i>						127-198
<i>Clematissa verrilli</i>					+	152-360
* <i>Menella grandiflora</i>						528
* <i>Echinomuricea brunnea</i>						140-500
* <i>Cyclomuricea flabellata</i>						183
<i>Muricella tenera</i>			+			130-1,385
* <i>Lepidogorgia gibbosa</i>						165-469
* <i>Lepidogorgia spiralis</i>						141
* <i>Chrysogorgia arborescens</i>						395-500
* <i>Chrysogorgia delicata</i>						293-500
<i>Chrysogorgia elegans</i>				+		237-347
<i>Chrysogorgia flexilis</i>					+	120-311
<i>Chrysogorgia lata</i>	+	+				385-1,016
<i>Chrysogorgia spiculosa</i>				+		313-800
<i>Chrysogorgia curvata</i>		+				415-105
* <i>Chrysogorgia flavescens</i>						923-1,081
<i>Chrysogorgia geniculata</i>	+	+				80-337
* <i>Chrysogorgia stellata</i>						355-371
<i>Metallogorgia melanotrichos</i>					+	414-1,081
<i>Metallogorgia squarrosa</i>		+				281-751
* <i>Iridogorgia bella</i>						409
* <i>Iridogorgia superba</i>						385-500
* <i>Pleurogorgia militaris</i>						1-171
* <i>Verrucella bicolor</i>						59-240

* The asterisk indicates a new species.

It will be seen that of the 29 species heretofore described and not confined to the Hawaiian region, 10 occur in China or Japan, 9 in the East Indies, 7 in the North Atlantic and West Indies, and 5 in the South Atlantic. Sixteen species are found in the western part of the Pacific, showing that about 55 per cent of the species not peculiar to the Hawaiian Islands are Asiatic in their relations. The 7 species indetical with Atlantic forms offer an interesting problem which may find its solution in the equatorial current which is supposed to have formerly swept through the Central American region and onward across the Pacific.

It is highly interesting to find that the Pacific coast of America is represented by but a single species, *Anthoptilum murrayi*, secured by the Bureau of Fisheries steamer *Albatross* from Erben Bank, off the California coast, and also in the Hawaiian region. This species, however, was previously reported by K  lliker^a as secured by the *Challenger* off the coast of Halifax, in 1,250 fathoms, and by Verrill as taken by the *Albatross* in 1883, and the *Fish Hawk* in 640-1362 fathoms. It occurred at a depth of 545 fathoms on Erben Bank. It is essentially a deep-water form and therefore apt to be distributed widely.

Mr. W. K. Fisher, in his excellent paper on the Starfishes of the Hawaiian Islands, remarks on the lack of relation between the faunas of our western coasts and that of Hawaii. In the preparation of a report which the writer hopes to publish in the near future the alcyonarian fauna of the Californian coast has been studied with some care, with the result that not more than one or two species are found to be common to the two regions.

Of the 68 species now known from the Hawaiian region, 39 are, so far as known, confined to that region, and the remainder show the relationship of the fauna to be strongly Asiatic, but with 12 species identical with Atlantic forms, and almost no connection with the fauna of the eastern coast of the Pacific.

Record of dredging stations at which Alcyonaria were secured during the Hawaiian cruise of the Albatross in 1902.

Station number.	Position.	Depth in fathoms.	Kind of bottom.	Species of Alcyonaria.
3793	Erben Bank; lat. N. 32° 52' 55"; long. W. 132° 34' 10".	412-545	Black manganese sand; foraminifera; rock.	<i>Anthoptilum murrayi</i> .
3824	South coast of Molokai Island.	222-498	Coral rock; broken shell.	<i>Pennatulid pearceyi</i> .
3826	do.....	371-430	Gray mud; coral rock.	<i>Chrysogorgia stellata</i> .
3828	do.....	281-319	Broken shell; gravel.	<i>Calibelemon symmetricum</i> , <i>Metallogorgia squarrosa</i> , <i>Calibelemon symmetricum</i> .
3836	do.....	238-255	Brown gray mud; shells.	
3838	do.....	92-212	Fine gray broken shells.	<i>Keroeides gracilis</i> , <i>Echinomuricea brunnea</i> .

^a Report on the Pennatulidæ dredged by H. M. S. Challenger during the years 1873-1876, 1880. p. 14.

Record of dredging stations at which Alcyonaria were secured during the Hawaiian cruise of the Albatross in 1902—Continued.

Station number.	Position.	Depth in fathoms.	Kind of bottom.	Species of Alcyonaria.
3842	South coast of Molokai Island.	495-506	Fine brown sand; mud; rock.	<i>Trichoptilum attenuatum.</i>
3853	do.....	115-134	Coarse sand; shell.	<i>Keroeides gracilis.</i>
3854	do.....	130-134	Sand; shell; rock.	<i>Muricella tenera.</i>
3856	Channel between Molokai and Maui islands.	127	Fine sand; yellow mud.	<i>Echinoptilum macintoshi</i> <i>Clematissa tenue.</i>
3857	do.....	127-128	do.....	<i>Clematissa tenue.</i>
3858	do.....	128-138	Fine sand; gray mud.	<i>Clematissa tenue.</i>
3859	do.....	138-140	Fine sand; mud.	<i>Pennatula flava</i> , <i>Keroeides gracilis</i> , <i>Paramuricea aquatorialis</i> , <i>Clematissa tenue</i> , <i>Echinomuricea brunnea</i> , <i>Clematissa tenue.</i>
3862	do.....	108-127	Coarse sand; shell; rock.	<i>Clematissa tenue.</i>
3863	do.....	127-154	Broken coral; coarse gravel; rock.	<i>Echinomuricea brunnea.</i>
3864	do.....	163-198	Fine volcanic sand; shell.	<i>Pennatula flava</i> , <i>Clematissa tenue.</i>
3865	do.....	256-283	Fine volcanic sand; rock.	<i>Clavularia spiculicola</i> , <i>Pennatula pallida</i> .
3866	do.....	283-284	Gray mud; fine sand.	<i>Pennatula pallida</i> , <i>Chrysogorgia elegans</i> .
3868	do.....	294-684	Fine gray sand; rock.	<i>Calibelemon symmetricum</i> , <i>Stenella helminthophora</i> , <i>Chrysogorgia flexilis</i> .
3879	South of Lanai Island.	923-1,081	Globigerina ooze; rock	<i>Stachyodes regularis</i> , <i>Chrysogorgia flavescens</i> .
3882	Channel between Maui and Molokai islands.	136	Sand; coral rock.	<i>Calyptraphora japonica</i> .
3883	do.....	227-284	Globigerina ooze.	<i>Clavularia spiculicola</i> .
3884	do.....	284-290	Globigerina; mud.	<i>Pennatula pallida</i> .
3885	do.....	136-148	Sand; pebbles.	<i>Echinomuricea brunnea</i> .
3898	Channel between Maui and Molokai islands.	258-284	Brown globigerina mud; fine sand.	<i>Calibelemon symmetricum</i> .
3901	do.....	280-311	Globigerina; sand; broken shell.	<i>Chrysogorgia flexilis</i> .
3904	North coast of Molokai Island.	295	Brown mud; shell; rock.	<i>Ceratois is paucispinosa</i> .
3907	South coast of Oahu Island.	304-315	Fine white sand; mud.	<i>Pennatula sanguinea</i> .
3908	do.....	304-308	do.....	<i>Pennatula sanguinea</i> .
3909	do.....	308-322	do.....	<i>Calibelemon symmetricum</i> .
3910	do.....	311-337	Fine gray sand; mud.	<i>Clavularia spiculicola</i> , <i>Pennatula sanguinea</i> , <i>Calibelemon symmetricum</i> , <i>Chrysogorgia elegans</i> .
3911	do.....	334-337	do.....	<i>Clavularia spiculicola</i> , <i>Calibelemon symmetricum</i> , <i>Chrysogorgia elegans</i> .
3914	do.....	289-292	Gray sand; mud.	<i>Clavularia spiculicola</i> .
3917	do.....	294-330	do.....	<i>Pennatula sanguinea</i> , <i>Chrysogorgia elegans</i> .
3919	do.....	220-257	Gray sand.	<i>Pennatula sanguinea</i> , <i>Calibelemon symmetricum</i> .
3925	do.....	299-323	Fine gray sand; mud; rock.	<i>Chrysogorgia flexilis</i> .
3935	Near Laysan Island.	57-79	White sand; broken shell; coralline.	<i>Siphonogorgia collaris</i> .
3957	do.....	173-220	Fine white sand.	<i>Pennatula flava</i> .
3973	French Frigate Shoal.	395-397	Coarse coral sand; shell; coral rock.	<i>Stachyodes regularis</i> , <i>Amphilaphis regularis</i> , <i>Stenella helminthophora</i> , <i>Chrysogorgia arborescens</i> .
3974	do.....	397-414	Fine coral sand; globigerina ooze.	<i>Stenella helminthophora</i> .
3979	Near Bird Island.	222-387	Fine white shell; foraminifera; rock.	<i>Umbellula gilberti</i> .
3982	Near Kauai Island.	40-233	Coarse broken coral; sand; shell.	<i>Amphilaphis biserialis</i> , <i>Verucella bicolor</i> .
3985	do.....	430-477	Gray sand; foraminifera; shore deposit.	<i>Umbellula jordani</i> .
3989	do.....	385-500	Coral sand; rock.	<i>Stachyodes dichotoma</i> , <i>Lepidogorgia gibbosa</i> , <i>Chrysogorgia lata</i> , <i>Umbellula jordani</i> , <i>Iridogorgia superba</i> .
3990	do.....	326-296	Gray sand; foraminifera; rocks.	<i>Lepidogorgia gibbosa</i> .
3992	do.....	528	Fine gray sand; mud.	<i>Caligorgia gilberti</i> , <i>Menella grandiflora</i> , <i>Metalogorgia squarrosa</i> .
3994	do.....	330-382	Fine gray sand; foraminifera.	<i>Calibelemon symmetricum</i> .

Record of dredging stations at which Alcyonaria were secured during the Hawaiian cruise of the Albatross in 1902—Continued.

Station number.	Position.	Depth in fathoms.	Kind of bottom.	Species of Alcyonaria.
3997	Near Kauai Island.....	418-429	Fine gray sand; brown mud.	<i>Umbellula jordanii</i> , <i>Calyptrophora wyvillei</i> , <i>Calyptrophora versluysi</i> , <i>Metallogorgia squarrosa</i> , <i>Ceratoisis fiabellum</i> .
3998	do.....	228-235	Coarse brown coral sand; shell; rock.	<i>Ceratoisis fiabellum</i> .
4002	do.....	53-230	Fine coral sand; globigerina ooze.	<i>Cladiscus studeri</i> .
4003	do.....	406-751	Fine sand; brown mud; globigerina; gray sand.	<i>Metallogorgia squarrosa</i> .
4007	Between Honolulu and Kauai Island.	508-557	Foraminifera.....	<i>Calyptrophora japonica</i> , <i>Calyptrophora versluysi</i> , <i>Stachyodes dichotoma</i> .
4013	Near Kauai Island.....	399-419	Fine gray sand; foraminifera.	
4016	do.....	305-318	Black sand.....	<i>Metallogorgia squarrosa</i> , <i>M. melanotrichos</i> .
4017	do.....	305	Gray sand.....	<i>Calibelemon symmetricum</i> .
4018	do.....	724-804	Foraminifera; sand; manganese fragm.	<i>Metallogorgia melanotrichos</i> .
4019	do.....	409-550	Gray sand; foraminifera; rock.	<i>Iridogorgia bella</i> , <i>Calyptrophora wyvillei</i> .
4030	do.....	423-438	Fine coral; sand; foraminifera; rock.	<i>Stachyodes dichotoma</i> , <i>Paragorgia nodosa</i> .
4036	West coast of Hawaii Island.	687-692	Fine dark gray sand; foraminifera.	<i>Protocaulon molle</i> .
4039	do.....	670-697	Gray mud.....	<i>Calibelemon symmetricum</i> .
4043	do.....	233-236	Foraminifera; gray sand; broken shell; rock.	<i>Anthoptilum murrayi</i> .
4058	Northeast coast of Hawaii Island.	190-195	Rocky.....	<i>Ceratoisis fiabellum</i> .
4060	do.....	759-913	Fine gray volcanic sand; foraminifera; rock.	<i>Umbellula carpenteri</i> .
4065	Channel between Hawaii and Maui islands.	491-500	Foraminifera; sand; rock.	<i>Clavularia corrugata</i> , <i>Chrysogorgia arborescens</i> .
4072	Northeast and north coast of Maui Island.	56-59	Coarse coral sand; foraminifera.	<i>Verrucella bicolor</i> .
4079	do.....	143-178	Gray sand; foraminifera.	<i>Pennatula flava</i> , <i>Echinomuricea brunnea</i> .
4081	do.....	202-220	do.....	<i>Pennatula pallida</i> , <i>Calibelemon symmetricum</i> .
4082	do.....	220-238	Gray sand.....	<i>Pennatula pallida</i> .
4086	do.....	283-308	Sand; shell.....	<i>Calibelemon symmetricum</i> .
4088	Northeast approach to channel between Maui and Molokai islands.	297-306	Fine gray sand.....	<i>Pennatula pallida</i> .
4090	do.....	304-308	do.....	<i>Pennatula pallida</i> .
4093	do.....	1,171-1,572	Fine gray sand; foraminifera; rock.	<i>Pleurogorgia militaris</i> .
4096	do.....	272-286	Fine gray sand.....	<i>Pennatula pallida</i> , <i>Calibelemon symmetricum</i> , <i>Protophilum wrightii</i> .
4097	do.....	286	do.....	<i>Pennatula pallida</i> .
4098	North coast of Maui Island.	95-152	Coral sand; foraminifera; rock.	<i>Spongodes alexanderi</i> , <i>Clematissa verrilli</i> .
4100	Channel between Maui and Molokai islands.	130-151	Coral sand; shell; foraminifera.	<i>Echinomuricea brunnea</i> .
4101	do.....	122-143	do.....	<i>Anthomastus steenstrupi</i> , <i>Spongodes alexanderi</i> , <i>Pennatula flava</i> , <i>Halisceptrum abies</i> .
4102	do.....	122-132	Foraminifera; fine gray sand.	<i>Pennatula flava</i> , <i>Clematissa tenue</i> .
4103	do.....	132-141	Fine gray sand.....	<i>Lepidogorgia spiralis</i> .
4104	do.....	123-141	Fine gray sand; foraminifera.	<i>Echinoptilum macintoshi</i> .
4105	Channel between Molokai and Oahu islands.	314-335	Fine coral sand; foraminifera.	<i>Calibelemon symmetricum</i> .
4107	do.....	350-355	Coral sand; foraminifera.	<i>Acanthogorgia armata</i> , <i>Chrysogorgia stellata</i> , <i>Metallogorgia squarrosa</i> .
4108	do.....	411-442	do.....	<i>Calyptrophora japonica</i> .
4114	Northwest coast of Oahu Island.	154-195	do.....	<i>Pennatula sanguinea</i> .
4116	do.....	241-282	do.....	<i>Pennatula sanguinea</i> .
4117	do.....	253-283	do.....	<i>Pennatula sanguinea</i> , <i>Calibelemon symmetricum</i> .

Record of dredging stations at which Alcyonaria were secured during the Hawaiian cruise of the Albatross in 1902—Continued.

Station number.	Position.	Depth in fathoms.	Kind of bottom.	Species of Alcyonaria.
4118	Northwest coast of Oahu islands.	253-322	Coral sand; foraminifera; rock.	<i>Calibelemon symmetricum</i> .
4119	do	84-167	Coral sand; foraminifera.	<i>Calibelemon symmetricum</i> .
4121	do	216-251	do	<i>Lepidisis longiflora</i> , <i>Acanella eburnea</i> .
4125	Channel between Oahu and Kauai islands.	963-1,124	Brown mud; foraminifera; rock.	<i>Umbellula carpenteri</i> , <i>Chrysogorgia flavescens</i> .
4126	do	743-1,278	Gray sand; foraminifera.	<i>Umbellula</i> , sp.
4130	Near Kauai Island.	283-309	Fine gray sand.	<i>Calibelemon symmetricum</i> , <i>Caligorgia gilberti</i> .
4131	do	257-309	do	<i>Calibelemon symmetricum</i> .
4132	do	257-312	Fine gray sand; mud.	<i>Caligorgia gilberti</i> .
4134	do	225-324	Fine coral; volcanic sand.	<i>Caligorgia gilberti</i> .
4137	do	411-476	Coral; volcanic sand; foraminifera; rock.	<i>Chrysogorgia lata</i> .
4139	do	339-512	Fine gray sand; rock.	<i>Umbellula carpenteri</i> .
4151	Near Bird Island.	313-800	Fine coral sand; foraminifera; stones.	<i>Chrysogorgia spiculosa</i> .
4153	do	962-1,059	Coral sand.	<i>Stachyodes bowersi</i> , <i>Chrysogorgia curvata</i> .
4156	do	286-568	White mud; foraminifera; rock.	<i>Acanthogorgia armata</i> .
4157	do	762-1,000	do	<i>Stenella helminthophora</i> , <i>Clematis alba</i> , <i>Metallogorgia melanotrichos</i> .
4161	do	39-183	Coral; coralline.	<i>Cyclomuricea fiabellata</i> .
4166	do	293-800	Coral sand; foraminifera; rock.	<i>Chrysogorgia delicata</i> .
4174	Near Niihau Island.	735-865	Gray sand; mud; globigerina; rock.	<i>Ceratoisis grandis</i> , <i>Stachyodes bowersi</i> .
4176	do	537-672	Gray sand; mud; foraminifera.	<i>Calibelemon symmetricum</i> .
4178	do	319-378	Coral sand; rock; pebbles.	<i>Anthomuricea tenuispina</i> .
4179	do	378-426	Coral sand; rock; pebbles.	<i>Acanthogorgia armata</i> .
4182	Near Kauai Island.	671-957	Manganese sand; globigerina; rock.	<i>Stachyodes dichotoma</i> .
4183	do	957-1,067	Fine gray sand; globigerina.	<i>Umbellula gilberti</i> .
4185	do	1,000-1,314	Gray sand; mud; foraminifera.	<i>Umbellula jordani</i> .
4186	do	508-682	Gray sand; foraminifera.	<i>Paramuricea hawaiiensis</i> .
4187	do	508-703	do	<i>Umbellula carpenteri</i> .

An analysis of the foregoing table shows that Alcyonaria were dredged at 112 stations out of the 403 dredging stations recorded for the Hawaiian cruise. It should be remembered, however, that the bottom was of such nature, being in a notably volcanic region, that a large percentage of the hauls were unsuccessful.

In all its long history the *Albatross* has never lost and ruined so much dredging gear in any one cruise as she did in the Hawaiian region. It is altogether likely that nearly half of all the successful hauls yielded alcyonarians, showing an exceedingly rich bottom for these forms. There are 161 lots of Alcyonaria in the collection, a "lot" being all of the specimens of a single species secured at a given station.

Two or more species were secured at 32 of the stations; three or more at 11 stations. Four species were secured at Station 3397, near

the island of Kauai, and at Station 4101, in the channel between Maui and Molokai islands.

The best hauls yielded five species each, one being at Station 3859, near Kauai, and the other being Station 3989, between Molokai and Maui.

The richest alcyonarian fauna appears to be off the island of Kauai and in the channel between Molokai and Maui and its northeast approach. There are doubtless other localities just as rich where the roughness of the bottom prevented successful hauls and a satisfactory exploration. It appears certain, from the quantity and variety of material secured, that the Hawaiian region is one of the best localities in the world for alcyonarian life. The fact that no species have heretofore been reported is doubtless due to the apparent lack of Alcyonaria in very shallow water. There would therefore be no likelihood of these forms being collected by the natives or other shore collectors.

There were only eight hauls where a depth of over 1,000 fathoms was reached, the deepest being at Station 4093, where a depth of 1,572 fathoms was recorded, and a single specimen of *Pleurogorgia militaris*, new species, was secured. But two successful hauls from which alcyonarians were obtained, each yielding a single species, were made in less than 100 fathoms.

SYSTEMATIC DISCUSSION OF HAWAIIAN ALCYONARIA.

With the exceptions about to be noted, the writer has followed in general the classification of the Alcyonaria adopted by Wright and Studer in their report on the Alcyonaria of the *Challenger* expedition.^a

In the treatment of the Pennatulacea the writer has practically adopted the classification as revised by Kölliker in his report on the *Challenger* collections of this group.^b With the families Chrysogorgidæ and Primnoidæ the superb monographs on these groups by Versluys^c have furnished the basis of the classification used. No better work has been done on the Alcyonaria than is embodied in these reports, and the present writer wishes here to acknowledge the very great assistance he has derived from the careful and masterly work of Versluys. The Chrysogorgidæ appears to be an unusually difficult group to handle in a satisfactory manner, and the division of

^a Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873-1876. By Prof. E. Percival Wright and Prof. Th. Studer, 1889.

^b Report on the Pennatulida dredged by H. M. S. Challenger during the years 1873-1876, 1880.

^c Die Gorgoniden der Siboga-Expedition. I. Die Chrysogorgiidae, von J. Versluys, Privat-Dozent an der Universitat Amsterdam. July. 1902. II. Die Primnoidea. (Same publication and author) 1905.

the genus *Chrysogorgia* into subgenera along the lines suggested by Versluys simplifies the problem greatly, although, as is usually the case in large and widely distributed groups, there is more or less intergradation between the subgenera, and these intergradations will doubtless increase with our increasing knowledge.

In the definitions of groups the writer has endeavored to give diagnoses rather than description; to preserve the essential characters while avoiding the confusing details that often obscure definition.

Order ALCYONACEA Verrill.

Polyps single or in colonies without an axis cylinder.

Family CORNULARIDÆ Verrill.

Polyps united by stolon-like processes, sometimes forming encrusting or lobular masses from which the individual polyps arise. Sometimes the polyps bear lateral buds.

Genus CLAVULARIA Quoy and Gaimard (modified).

Spicules present. Colonies consisting of band-like stolons from which the polyps arise singly, or of branched forms arising from a stolon-like or encrusting base.

The genus as here defined includes the genera *Clavularia* and *Telesto* of authors, which were differentiated on the basis of the two modes of growth above indicated. One of the new species described below shows that these two modes are united in a single species. The diagnostic feature by which these genera have been separated is not of generic, or even specific, rank, and the genera are therefore united in the one genus *Clavularia*.

CLAVULARIA SPICULICOLA, new species.

Plate XLI, fig. 1; plate XLVII, fig. 1.

Colony in the form of a creeping stolon which often surrounds a long sponge spicule for its entire length, so that the spicule forms a sort of false axis.

At other times the stolon is band-like, covering but one side of the spicule. The calyces vary greatly in their distance from each other, there being no regularity whatever in their disposition, but they are generally quite distant from each other, the distance perhaps averaging about 5 mm.

Other colonies exhibit an altogether different habit, taking on the typical mode of growth of the genus *Telesto*, forming branching colonies, of which the branches arise as buds from the body of the original or axial polyp. Branches of a second order also occur, and

in some cases the mode of growth of the genera *Cornularia* and *Telesto* are combined in the same specimen, the colony starting in the primitive way on a sponge spicule and giving off branches which themselves branch like *Telesto* colonies. Several cases were found in which a number of the sponge spicules 7 or 8 inches long are involved in one mass by anastomoses of the branching polyps. The branching forms attain a height of 50 to 100 mm.

The calyces vary enormously in size, some being 10 mm. in height and 1 mm. in diameter, while others are less than 2 mm. high. Their diameter is fairly constant.

The calycular walls are marked by eight longitudinal costæ and terminate distally in an eight-rayed rosette. The polyps are completely retractile.

The spicules are stout warty spindles and clubs, the verrucae being very thickly crowded.

The color is light brown, sometimes yellowish.

Type.—Cat. No. 22574 U.S.N.M., *Albatross* Station 3910, north coast of Molokai, 337 fathoms.

Distribution.—Between the islands of Molokai and Maui; Station 3865, 265–283 fathoms (Cat. No. 22572, U.S.N.M.); Station 3883, 277–284 fathoms.

North coast of Molokai: Station 3910, 311–337 fathoms (Cat. No. 22574, U.S.N.M.); Station 3911, 224–337 fathoms (Cat. No. 22571, U.S.N.M.); Station 3914, 289–292 fathoms (Cat. No. 25351, U.S.N.M.).

CLAVULARIA CORRUGATA, new species.

Plate XLI, fig. 2.

The usually somewhat distant polyps are connected by band-like solenia that in places expand into lobular masses from which one or two polyps spring. Polyps cylindrical, 2 to 4 mm. high, slightly expanded basally, walls strongly grooved longitudinally, there being eight grooves and corresponding costæ. The distal part of the walls is transversely corrugated, so that the corrugations and grooves together cut up the surface into a regular series of squarish nodules. Distal end forming an eight-rayed rosette over the retracted tentacles.

Spicules.—Stout warty spindles, shorter in proportion to length than in other species of the genus, packing the walls of the solenia and polyps. In the polyp walls they have no regular disposition, but seem to be crossed in almost every direction. They seem to be absent from the tentacles.

Color.—Very light brown, almost white in alcohol.

This species is smaller in size than any other of the genus except *C. australiensis* and *C. frigida*. It differs from either of these in the character of the spicules and in the rugosity of the polyps.

Type.—Cat. No. 22594, U.S.N.M., *Albatross* station 4065, between Hawaii and Maui islands, 491–500 fathoms.

Family ALCYONIDÆ Verrill (emended).

Colonial forms with the proximal portion of the stem usually devoid of polyps. Cœnenchyma thick. Spicules abundant. Polyps retractile.

Genus ANTHOMASTUS Verrill.

Colony forming a rounded mass supported on a short peduncle. Polyps retractile. Siphonozoids numerous. Cœnenchyma fleshy.

ANTHOMASTUS STEENSTRUPI Wright and Studer.

Anthomastus steenstrupi WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 243.

A colony of this species was taken from a depth of 122–143 fathoms off the north coast of the island of Maui, Station 4101. The specimen agrees well with the description of the original which was secured off the coast of Japan from a depth of 565 fathoms.

Family NEPHTHYIDÆ Verrill.

Branched colonial forms, much like the Alcyonidæ except that the tentacles do not retract within the body cavity of their polyps, but simply fold over the oral disk in retraction.

Genus SPONGODES Verrill.

Walls between the canals of the stem with few or no spicules. Polyp-heads with large conspicuous fusiform spicules, bundles of which overarch the heads themselves. Cortex with large and abundant spicules.

SPONGODES ALEXANDERI, new species.

Plate XLI, fig. 3; plate XLVII, fig. 2.

Colony attaining a height of about 64 mm. Stem without polyps for about 25 mm. above the constricted base. A large branch (broken) arises about 30 mm. above the base, and near the top the colony is broken up into five rather slender, finger-like branches. The polyps are single, and scattered over the upper part of the stem and branches, but tend to form small terminal clusters of closely aggregated but fairly distinct polyps.

Spicules.—Long, very large, warty spindles, longitudinally placed in the walls of the stem, branches and calyces. The latter are quite large, and distinctly overtop the polyps, the spicules arising in two or more bundles on the outer side of the calyx wall. There is a strongly marked collar of spicules below the tentacle bases. Above the collar are large spicules sometimes arranged *en chevron*, sometimes without apparent regularity, that form a pseudo operculum. The tentacles bear on their dorsal surface a double row of small transverse spicules. Largest spicules in calyx wall $2\frac{1}{2}$ mm. long.

Color.—Very pale, almost white in alcohol. There is no reddish tint whatever.

Distribution.—North coast of the island of Maui; Station 4101, 122–143 fathoms (type, Cat. No. 25361, U.S.N.M.); Station 4098, 95–152 fathoms (Cat. No. 22544, U.S.N.M.).

This species belongs to the “*Divaricatæ*” group of *Spongodes*. In one specimen from Station 4098 the spicules of the pseudo operculum are bright crimson in color, but there appears to be no other important difference between this specimen and the others.

The species is named after Mr. A. B. Alexander, Fisheries Expert on the *Albatross* during the Hawaiian cruise.

Genus SIPHONOGORGIA K  lliker.

Walls between stem canals with numerous spicules. Colony branched, externally resembling a gorgonian. C  nenchyma abundant in walls of canals and filled with large spicules. Tentacles retractile.

SIPHONOGORGIA COLLARIS, new species.

Plate XLI, fig. 4.

Only a fragment of this species was secured, consisting of the terminal portion of a thick branch, 6 mm. wide by 13 mm. long. The canals are numerous and irregular, with long spindle-shaped spicules and also minute spindles in their walls. The polyps are thickly clustered over the entire surface, reminding one of the end of a branch of *Acropora muricata* forma *prolifera*.

The calyces are prominent, $3\frac{1}{2}$ mm. high by $1\frac{1}{2}$ mm. in diameter at the middle, tubular, narrowing gradually at the distal end. The whole surface is packed with quite large, stout, warty spicules arranged longitudinally both in the c  nenchyma and calycular walls. In the latter there is a distinct circlet of rather slender but large spicules, below which the spicules are stouter and sometimes resemble imbricating scales.

The polyps have a thick collar of curved transverse spicules which is much wider and more conspicuous than usual. Above the collar and

at the base of each tentacle there are a few spicules arranged *en chevron*, and then a few longer and more slender spicules which are outside of the latter, and curved to meet each other so that their distal ends are parallel to the axis of the tentacle; the whole forming a rather high conical operculum. All of the spicules are covered densely with minute verrucæ so small as to appear as mere granules.

Color.—Coral red.

Type.—Cat. No. 25318, U.S.N.M., *Albatross* Station 3935, off Laysan Island, 59–79 fathoms.

This species differs from *S. köllikeri* in having much more exerted and more crowded calyces.

Order PENNATULACEA.

Colonial forms not permanently attached to the bottom or to other objects. Stem with an axial cavity which is often longitudinally subdivided by thin partitions and contains an axis cylinder. Spicules needle-like or bar-like, never warty. Both polyps and siphonozoids are generally present.

Family PENNATULIDÆ Kölliker.

Axis and pinnæ present, the latter large, and without calcareous ray-like bodies. Colony feather-shaped.

Genus PENNATULA Linnæus (part).

The leaves or pinnæ have spicules scattered over their entire surface.

Pennatula pendula T. & L.
= PENNATULA SANGUINEA, new species.

Plate XLI, figs. 7 and 8.

Colony about 100 mm. long. Stem slightly expanded or swollen at base, 28 mm. long. Rachis 63 mm. long. Leaves about eighteen on each side, increasing in length from below upward to near the distal end, and then diminishing rapidly. Longest leaf about 32 mm. in length, with six polyps; an elongated triangle in shape with a maximum breadth of $3\frac{1}{2}$ mm. Calyces rather prominent, cylindrical, obliquely placed so as to point toward distal end of leaf; height, on the longest side, $2\frac{1}{2}$ mm.; diameter, $1\frac{1}{2}$ mm.; margin with eight prominent, acute teeth composed of numerous spicules.

Spicules.—Needle-shaped, crowding the entire surface of leaves and calyces, crisscrossed in every direction. Those in calyces longitudinally arranged in distal part and crisscrossed in proximal portion. Polyps without tentacular spicules.

Zooids.—Ventral zooids forming short rows leading inward and downward from the bases of the leaves. There is a more conspicuous row of five or six zooids on the rachis just back of the base of each leaf. Each zooid is surrounded by a circlet of perpendicularly placed spicules. Ova are seen near the bases of the leaves in the downward continuations of the polyp cavities.

Color.—Bright scarlet. Polyps white (perhaps yellow in life).

Type.—Cat. No. 22597, U.S.N.M., *Albatross* Station 4116, between Oahu and Molokai, 241–282 fathoms.

Distribution.—South coast of Oahu: Station 3907, 304–315 fathoms; Station 3908, 304–308 fathoms (Cat. No. 25414); Station 3910, 311–337 fathoms (Cat. No. 25329, U.S.N.M.); Station 3917, 295–330 fathoms (Cat. No. 22582, U.S.N.M.); Station 3919, 220–257 fathoms (Cat. No. 22599, U.S.N.M.).

Between Oahu and Molokai: Station 4114, 154–195 fathoms; Station 4116, 241–282 fathoms (Cat. No. 22597, U.S.N.M.); Station 4117, 253–283 fathoms (Cat. No. 22600, U.S.N.M.).

One of the prettiest and most abundant pennatulids in the collection.

PENNATULA FLAVA, new species.

Plate XLI, figs. 5 and 6.

Length of a large specimen 200 mm. Stem, to first leaf with normal polyps, 100 mm. The stem has a small basal bulb and an elongated swollen portion commencing about 25 mm. above the proximal end, and gradually diminishing until the ordinary caliber is attained below the first leaves; varying, however, considerably in different specimens. Leaves not so closely approximated as is usual in the genus, those with normal polyps being about twenty-five in number on each side; the larger ones being 20 mm. long by $3\frac{1}{2}$ mm. broad. They are an elongated triangle in shape.

Polyps six to nine in number, decreasing toward proximal leaves, the last having but a single polyp. Calyces cylindrical, in a single row, directed toward the distal ends of the leaves, increasing in length from the proximal to the distal end of the leaf; average length of longest side, 2 mm.; margin with eight acute, elongated points.

Spicules of the usual needle shape, bright yellow in color, usually of smaller size but abundant on the stem and rachis; almost absent on leaves except at their extreme bases, and on the polyp band; there being a few, however, on the general surface of the leaves. Those on the calyx walls larger, arranged in eight longitudinal rows, the upper ends of the rows projecting into the eight marginal points.

Below the true leaves there is a long series of rudimentary leaves which dwindle away into mere spiny points. This series reaches to within 47 mm. of the basal end of the stem in a specimen 8 inches long.

Zooids.—Much less numerous than is usual in this genus. There is a row of eight to twelve on ventral side at junction of each leaf with the rachis, each zooid being surrounded by a circlet of spicules converging at their distal ends.

Color.—Bright yellow throughout.

Type.—Cat. No. 22579, U.S.N.M., *Albatross* station 4101, between Molokai and Maui, 122–143 fathoms.

Distribution.—Between Molokai and Maui: Station 3859, 138–140 fathoms (Cat. No. 22576, U.S.N.M.).

Between Maui and Molokai: Station 3864, 163–198 fathoms; Station 4102, 122–132 fathoms (Cat. No. 22578, U.S.N.M.).

Off Laysan Island: Station 3957, 173–220 fathoms (Cat. No. 22581, U.S.N.M.).

Northwest coast of the Island of Hawaii: Station 4079, 143–178 fathoms (Cat. No. 22577, U.S.N.M.).

The specimen from Station 3864 was $10\frac{1}{2}$ inches long.

PENNATULA PALLIDA, new species.

Plate XLI, figs. 9 and 10.

Largest specimen 175 mm. long; stem to first rudimentary leaf 28 mm.; rachis, including portion bearing the rudimentary leaves, 112 mm. long. The stem is swollen at the base, with another bulging portion about 25 mm. above the end bulb.

Functional leaves nineteen on each side, long, much narrower proportionally than in other species, 11 mm. long, 4 mm. broad at base, recurved.

Polyps usually four to each leaf, short, the calyces inclined toward the distal ends of the leaves so much that the outer side of one is adnate to the inner side of the next one nearly to the margin of the former; margin flaring, with about eight acute spines. Calyces 2 mm. long on inner side, and 2 mm. broad.

Spicules.—The spicules of this species are large and conspicuous, of the usual needle-shaped type, crowded over the entire surface of rachis, stem, leaves, and calyces, their points often projecting, giving a harsh, hirsute appearance under a low magnification, except on the lower part of stem, which is comparatively smooth. The spicules are crisscrossed in every direction on leaves and lower part of calyces, but on the upper parts of the calyx walls they are vertical, and arranged in eight rib-like bands which project upward into the eight marginal teeth. The tentacles are without spicules.

Zooids.—A row of about a dozen zooids joins the adjacent leaf bases on the ventral side of the rachis. There are other but shorter rows on the latero-dorsal ridge, which is plainly marked in this species. The hirsute appearance of the rachis, already referred to, makes it difficult to count the zooids with certainty.

Color.—Very pale light brown or buffy. Pallid, almost white.

Type.—Cat. No. 22547, U.S.N.M., *Albatross* Station 4097, between Maui and Molokai, 286 fathoms.

The largest specimen has no locality label.

Distribution.—Between Molokai and Maui: Station 3865, 256–283 fathoms (Cat. No. 22552, U.S.N.M.); Station 3866, 283–284 fathoms (Cat. No. 22549, U.S.N.M.).

Between Maui and Molokai: Station 3884, 284–290 fathoms (Cat. No. 25368, U.S.N.M.); Station 4082, 220–238 fathoms; Station 4088, 297–306 fathoms (Cat. No. 22554, U.S.N.M.); Station 4090, 304–308 fathoms; Station 4096, 272–286 fathoms (Cat. No. 22548, U.S.N.M.); Station 4097, 286 fathoms (Cat. No. 22547, U.S.N.M.).

Northeast coast of Hawaii: Station 4081, 202–220 fathoms (Cat. No. 22550, U.S.N.M.).

? *PENNATULA PEARCEYI* Kölliker.

Pennatula pearceyi KÖLLIKER, Report on the Pennatulida dredged by H. M. S. Challenger during the years 1873–1876, 1880, p. 4.

A specimen secured at Station 3824 (Cat. No. 25365, U.S.N.M.), south coast of Oahu, appears to belong to this species, although it is considerably longer and more slender than the type as described by Kölliker. The specimen is much mutilated, and is referred to this species with much doubt.

The original specimen was taken by the *Challenger* south of the coast of Japan at a depth of 565 fathoms.

Genus *HALISCEPTRUM* Herklots.

Pennatulidæ in which the leaves are without spicules.

HALISCEPTRUM ABIES Kölliker.

Halisceptrum abies KÖLLIKER, Anatomische-Systematische Beschreibung der Alcyonarien, 1st Abth., Die Pennatuliden, 1872, p. 182.

An incomplete specimen, which, like the one described by Kölliker from the Copenhagen Museum, is without stem and undeveloped leaves, was secured at Station 4101, north coast of Maui, depth 122–143 fathoms. (Cat. No. 22588, U.S.N.M.)

This specimen agrees well with the original describer's exceedingly brief description, except that the calyces are more exerted. The specimen appears to have been broken off from the stem some time before it was captured. Indeed the proximal end is rounded, as if it were possible that it never had a true stem.

The original specimen came from Japan.

Family ECHINOPTILIDÆ Hubrecht.

Small, pennatula-like forms in which the axis cylinder is wanting.

Genus ECHINOPTILUM Hubrecht.

ECHINOPTILUM MACINTOSHI Hubrecht.

Echinoptilum macintoshi HUBRECHT, Proc. Zool. Soc. London, 1885, p. 512.

Specimens of this very interesting form were taken by the *Albatross* at Station 3856, between Molokai and Maui, 127 fathoms (Cat. No. 22564, U.S.N.M.) and at Station 4104, between Molokai and Maui, 123–141 fathoms.

The type was taken in the Japanese Sea at a depth of 71 fathoms.

Family ANTHOPTILIDÆ K  lliker.

Rachis without pinnules; polyps on both sides of the rachis, in distinct rows; ventral zooids present; polyps naked, without calyces.

Genus ANTHOPTILUM K  lliker.

Polyps in many short rows, on both sides of rachis; no streak of undeveloped polyps on lower part of rachis; zooids lateral, ventral and dorsal.

ANTHOPTILUM MURRAYI K  lliker.

Anthoptilum murrayi K  LLIKER, Report on the Pennatulida dredged by H. M. S. Challenger during the years 1873–1876, 1880, p. 14.

The specimens in the Hawaiian collection agree with the original description, except that the polyps are of a deep amber-brown color. The bulb at the proximal end of the stem is greatly expanded into a body much like the expanded roots of many gorgonians.

Distribution.—Erben Bank, off the coast of California: Station 3793, 412–545 fathoms (Cat. No. 25324, U.S.N.M.).

West coast of Hawaii: Station 4043, 233–236 fathoms (Cat. No. 25323, U.S.N.M.).

The type was taken by the *Challenger* from the North Atlantic, south of Halifax, at a depth of 1,250 fathoms.

East coast of North America, 640–1,362 fathoms (Verrill).

Family KOPHOBELEMNONIDÆ K  lliker.

Polyps on both sides of rachis, in a single series or in distinct rows; polyps large, sessile, without calyces; rachis elongated, in comparison with that of the next family.

Genus CALIBELEMNON, new genus.

Spicules almost or completely wanting; sarcosoma thick and fleshy; polyps large, the general arrangement being in opposite pairs.

Type.—*Calibelemnon symmetricum*.

This genus shows the nearest approach to the next family, the Umbellulidæ, of any known form, and forms a link of a chain of intergradation between the family Kophobelemnonidæ and Umbellulidæ, the general shape of the colony allying it with the former, while the naked large polyps are apparently almost identical with those of the latter.

CALIBELEMNON SYMMETRICUM, new species.

Plate XLII, figs. 1 and 2.

Total length of colony 108 mm.; stem 50 mm.; rachis 55 mm. Stem fleshy, rather distinct end-bulb, and a fleshy swelling reaching the greater part of the distance to beginning of rachis. Rachis more slender, the axis reaching through its entire length, as well as through the entire stem, and projecting as a point beyond the distal pair of polyps.

Polyps in pairs, projecting from ventral side of rachis, but implanted laterally; in general they are arranged in groups of two pairs; of which the upper is smaller and apparently younger than the lower, and is inserted more ventrally than the latter. This arrangement, although common, is not constant. There is often a regular increase in size from the lowest to the distal polyps, the lowest being but 2 mm. in height, and the distal being 11 mm. to the base of the tentacles. The colony is often terminated by three polyps in a cluster, one being between the distal pair and having behind it the sharp distal end of the axis.

The individual polyps have a swollen basal portion in which the ova are seen and which is 2 to 3 mm. high; the remaining portion of the body being longitudinally ribbed by the mesenteries showing through as whitish bands relieved strongly by the purplish brown of the intervening polyp walls, and transversely corrugated by numerous fine muscle bands. The tentacles themselves are very long, filamentous and nonretractile. The entire polyp is almost exactly like a small *Umbellula* polyp.

Zooids.—Both the ventral and dorsal sides of the rachis have a median well-defined longitudinal band which is entirely devoid of zooids, so that it is impracticable to decide which is dorsal and which ventral, although, judging from certain species of *Umbellula*, the side with the free end of the rachis is ventral. The zooids are crowded in great numbers over the entire surface of the rachis, with the exception of the bands above referred to.

Color.—Stem and rachis creamy white, polyp bodies purplish brown banded with yellowish white.

Type.—Cat. No. 22534, U.S.N.M., *Albatross* Station 3909, north coast of Molokai, 308–322 fathoms.

Distribution.—South coast of Molokai: Station 3828, 281–319 fathoms (Cat. No. 22531, U.S.N.M.); Station 3836, 238–255 fathoms (Cat. No. 22537, U.S.N.M.).

Between Molokai and Maui: Station 3868, 294–684 fathoms (Cat. No. 22522, U.S.N.M.); Station 4096, 272–286 fathoms (Cat. No. 22525, U.S.N.M.); Station 3898, 258–284 fathoms (Cat. No. 22538, U.S.N.M.).

North coast of Molokai: Station 3909, 308–322 fathoms (Cat. No. 22534, U.S.N.M.); Station 3910, 311–337 fathoms; Station 3911, 334–337 fathoms (Cat. No. 22532, U.S.N.M.); Station 3919, 220–257 fathoms (Cat. No. 22530, U.S.N.M.).

Off Kauai: Station 3994, 330–382 fathoms (Cat. No. 22529, U.S.N.M.); Station 4017, 305 fathoms (Cat. No. 22541, U.S.N.M.); Station 4130, 283–309 fathoms (Cat. No. 22526, U.S.N.M.); Station 4131, 257–312 fathoms (Cat. No. 22542, U.S.N.M.).

South coast of Oahu: Station 4039, 670–697 fathoms. (Cat. No. 22539, U.S.N.M.)

Between Molokai and Oahu: Station 4105, 314–335 fathoms (Cat. No. 22528, U.S.N.M.); Station 4118, 322 fathoms (Cat. No. 22535 U.S.N.M.).

Northwest coast of Oahu: Station 4117, 253–283 fathoms (Cat. No. 22536, U.S.N.M.); Station 4119, 84–167 fathoms (Cat. No. 22533, U.S.N.M.).

Northeast coast of Hawaii: Station 4081, 202–220 fathoms (Cat. No. 22527, U.S.N.M.).

North coast of Maui: Station 4086, 283–308 fathoms. (Cat. No. 22523, U.S.N.M.)

Off Bird Island: Station 4176, 537–672 fathoms.

This species is the most abundant one in the collection.

Family UMBELLULIDÆ K  lliker.

Polyps very large, without calyces, and borne in a cluster at the end of an exceedingly long stem.

Genus UMBELLULA Lamarck.

Being the only genus in the family, it has the same diagnostic characters.

UMBELLULA CARPENTERI K  lliker.

Umbellula carpenteri K  LLIKER, Report on the Pennatulida dredged by H. M. S. Challenger during the years 1873-1876, 1880, p. 23.

A number of specimens collected during the Hawaiian cruise at the following stations are referable to this species:

Distribution.—Northeast coast of Hawaii: Station 4060, 759-913 fathoms. (Cat. No. 25343, U.S.N.M.)

Between Oahu and Kauai: Station 4125, 963-1124 fathoms. (Cat. No. 25344, U.S.N.M.)

Off Kauai: Station 4139, 512-339 fathoms (Cat. No. 25342, U.S.N.M.); Station 4187, 508-703 fathoms (Cat. No. 25345, U.S.N.M.).

The type specimen was secured by the *Challenger* in the North Pacific, south of Yeddo, from a depth of 565 fathoms.

UMBELLULA JORDANI, new species.

Plate XLII, fig. 3.

Total length of large specimen about 400 mm.; polyps to tentacle bases 17 mm.; tentacles, not fully expanded, 11 mm. There is an end bulb at proximal end of the stem which is continuous with a swelling which is distinctly quadrangular in section. Otherwise the stem is quite slender, quadrangular in section, gradually merging at its distal end into the short rachis.

Polyps nine, in largest specimen, eight being arranged around a central ninth, the whole head showing little trace of bilateral symmetry in this specimen, although it is distinct in other and smaller ones. Polyp bodies smooth, not strongly corrugated as in *U. huxleyi*, which appears to be the most nearly related known species.

Zooids.—Rather large, not very much crowded on terminal swelling, where they tend to assume a linear arrangement; the lines being continuous with the patches of zooids between the polyp bases. These patches are drawn into a long angle below. A few zooids are seen among the polyps on the dorsal side, and also on the lower swelling and end bulb. They are not so large as those of *U. huxleyi*.

Spicules apparently wanting.

Color.—In alcohol, stem nearly white; polyps umber brown, except where the surface is abraded. In the latter case the color is bluish white.

This species resembles *U. huxleyi* in color, and *U. magniflora* in arrangement of zooids, but does not have the conspicuous terminal flattened swelling of the latter.

Named in honor of President David Starr Jordan, of Stanford University.

Type.—Cat. No. 25319, U.S.N.M., *Albatross* Station 3985, off Kauai, 430-777 fathoms.

Distribution.—Off Kauai: Station 3985, 430–477 fathoms (Cat. No. 25319, U.S.N.M.); Station 3989, 385–500 fathoms (Cat. No. 25322, U.S.N.M.); Station 3997, 418–429 fathoms (Cat. No. 25321, U.S.N.M.); Station 4185, 1,000–1,314 fathoms (Cat. No. 25320, U.S.N.M.).

UMBELLULA GILBERTI, new species.

Plate XLII, fig. 4.

Total length of stem 185 mm.; end bulb and lower swelling together 30 mm.; polyp body to tentacle base 8 mm.; tentacles 20 mm.

Stem slender, with end bulb and swelling better differentiated than in the last species, the latter quadrangular in section. Symmetry radial.

Polyps, in best specimens, five in number; bodies smooth, longitudinally ribbed by the mesenteries showing through. Tentacles much longer in proportion than in *U. jordani*.

Zooids very few in number, in groups of five or six between the bases of the polyps, apparently without tentacles. A few are seen sparsely distributed on terminal swelling. They are apparently absent from specimen from Station 4183.

Color.—Stem very light brown; end bulb and swelling more decided sienna brown; polyps umber brown, the ribs lighter.

Named for Prof. Charles H. Gilbert, of Stanford University.

Type.—Cat. No. 22586, U.S.N.M., *Albatross* Station 4183, off Kauai, 957–1,067 fathoms.

Off Bird Island: Station 3979, 222–387 fathoms.

UMBELLULA, species.

Plate XLII, fig. 9.

A fragmentary specimen was secured at Station 4126, between Oahu and Kauai, which had but two polyps and a very short portion of the stem below the rachis.

This specimen is not sufficiently well preserved for specific description, but the following points were made out:

The two polyps are nearly opposite, with bodies about 13 mm. long and tentacles 23 mm. The body is much corrugated transversely and has eight longitudinal ribs.

Rachis broad and club-shaped.

Spicules very numerous, small, needle-shaped, crowded throughout the entire surface of rachis, polyps and tentacles.

Zooids not easily distinguishable, but apparently rather sparsely distributed on surface of rachis and basal parts of polyps.

This is the only *Umbellula* in the collection that has evident spicules on the rachis and polyps.

Family PROTOCAULIDÆ Kölliker.

Polyps on both sides of rachis in a single series, or in indistinct rows. Polyps small and without calyces.

Genus PROTOCAULON Kölliker.

Polyps alternate, sessile. Spicules absent.

PROTOCAULON MOLLE Kölliker.

Protocaulon molle KÖLLIKER Report on the Pennatulida dredged by H. M. S. Challenger during the years 1873-1876, 1880, p. 26.

A small specimen in poor condition answers well to the description and figure of this species given in the original description.

Distribution.—West coast of Hawaii: Station 4036, 692 fathoms (Cat. No. 22543, U.S.N.M.). The type specimen was secured by the *Challenger* northeast of New Zealand at a depth of 700 fathoms.

Family PROTOPTILIDÆ Kölliker.

Rachis long and slender, bearing sessile polyps in a single series of indistinct rows on opposite sides. Calyces present.

Genus PROTOPTILUM Kölliker.

Zooids growing all around the rachis, leaving only the median ventral line uncovered.

PROTOPTILUM WRIGHTI, new species.

Plate XLII, fig. 7.

Length of colony 65 mm.; of stem to rudimentary polyps 21 mm. Stem rather slender, without appreciable bulb, but hooked at proximal end, and with a slight swelling above the hook. Rachis larger, increasing in size to the distal end.

Polyps usually in two rows, one on each side, but with an occasional one placed on the stem more toward the central line than the others. In general the polyps are alternately disposed, placed rather on the dorsal than the ventral side. They differ greatly in size, the smaller (younger?) ones being nearer the mid-dorsal line than the others, thus giving in places an appearance of an arrangement in rows of two. There are many rudimentary polyps on the lower part of the rachis. Calyces almost entirely immersed, their inner margins being not at all exerted; margins without distinct teeth, although the needle-like spicules sometimes give an appearance of serration.

Calyces very small, not more than $1\frac{1}{2}$ mm. high. Polyps retractile, without spicules.

Spicules needle-like, abundant, disposed longitudinally, or nearly so, throughout the colony.

Zooids large, arranged on each side of a bare mid-ventral band. They are very sparsely distributed on lateral and dorsal surfaces. Each zooid is surrounded by a tuft of converging spicules.

Color.—Deep rose red on rachis and calyces. Stem light yellow. The polyps were probably bright yellow in life, but are a yellowish white in alcohol.

Type.—Northeast approach to channel between the islands of Maui and Molokai: Station 4096, 272–286 fathoms (Cat. No. 22585, U.S.N.M.)

Named for Prof. E. P. Wright.

Genus TRICHOPTILUM K  lliker.

Polyps alternately arranged; margins of calyces with eight spines; spicules numerous in calyces and tentacles; zooids dorsal.

TRICHOPTILUM ATTENUATUM, new species.

Plate XLII, fig. 8.

Colony exceedingly long and slender. Entire length 325 mm.; stem, from base to first rudimentary polyps, 112 mm. There is a slightly swollen end bulb, and a less pronounced gentle swelling about 37 mm. above it. Average diameter of stem about $1\frac{1}{2}$ mm. The stem is quadrate in section.

Polyps arranged somewhat irregularly in two dorso-lateral rows, sometimes opposite and sometimes alternate, large and small individuals being interspersed.

The individual polyps are large and conspicuous, with exceedingly elongated calyces which attain a length of 6 mm. and a diameter of $1\frac{1}{2}$ mm. The basal part of the body is sharply differentiated from the distal, the former being transversely wrinkled and having the needle-like spicules crisscrossed, having a length of about $3\frac{1}{2}$ mm., and appearing somewhat like a short branch with which the second part or true calyx is continuous. This second part is somewhat swollen in the middle and bears eight narrow longitudinal bands of spicules continuing upward above the margin into eight sharp teeth. The tentacles are without spicules, and are arranged in a cylindrical vertical bundle in contraction.

Spicules, needle-like, abundant in rachis and calyces.

Zooids in short rows of two or three on dorsal surface, running obliquely inward from below the bases of the calyces.

Color.—The stem and rachis is white, polyps umber-brown.

Type.—Cat. No. 25352, U.S.N.M.: *Albatross* Station 3842, south coast of Molokai, 495–506 fathoms. Numerous specimens.

The polyps of this species are very easily detached, and but few remain in place on the specimens secured, most of them having fallen to the bottom of the jar.

Genus *CLADISCUS* Koren and Danielssen.

Spicules absent or sparsely distributed; calyces present, but indicated only by the eight shallow lobes around the margin.

CLADISCUS *STUDERI*, new species.

Plate XLII, figs. 5, 6.

Colony attaining a height of 150 mm.; end bulb not well developed; stem with a stiff axis which is quadrangular in section, and measures 41 mm. to the lowest rudimentary polyps.

Calyces long, cylindrical, crowded on ventral and lateral surfaces so densely that no distinct arrangement in series can be discerned; differing greatly in size, those of different sizes being intermingled, except on basal part of rachis where they are all small; the longest about 6 mm. in height. The calycine walls are so thin and so nearly devoid of spicules that the polyps appear to be without calyces at first view, and the walls are semitransparent, showing eight longitudinal bands corresponding to the mesenteries inside. The margin is ornamented by eight pointed angular flaps that are sometimes everted. The polyps are retractile and have long tentacles.

Spicules are not entirely wanting, as in other species of the genus, but are very sparsely distributed, being found mainly in the eight longitudinal bands on the polyp walls, where they are needle-like and colorless. On superficial examination the spicules appear to be entirely absent.

Zooids are scattered in small groups of four or five between the bases of the polyps on the dorsal surface of the rachis. The ventral surface has a broad band entirely devoid of polyps and zooids.

Color.—Very pale brown in the two specimens secured.

Type.—Cat. No. 25347, U.S.N.M., *Albatross* Station 4002, off Kauai Island, 53–230 fathoms.

Koren and Danielssen say that *Cladiscus loveni* and *C. gracilis* have well marked calyces, although Kölliker overlooked the fact. *C. loveni* is said to be entirely without spicules.

The crowding of the polyps destroys the bilateral symmetry characteristic of the family, the only indication of such symmetry being in the bare ventral band.

Order GORGONACEA.

Fixed colonial forms with a distinct axis cylinder composed of calcareous or chitinous material.

Section SCLERAXONIA.

Axis composed of calcareous spicules, which are either free or fused into a solid mass.

Family BRIAREIDÆ Wright and Studer.

Axis cylinder composed of closely packed but distinct spicules.

Genus PARAGORGIA Milne-Edwards.

PARAGORGIA NODOSA Koren and Danielssen.

Paragorgia nodosa KOREN and DANIELSSEN, Nye Alcyonider, Gorgonider og Pennatulider tilhørende Norges Fauna, Bergen, 1883, p. 18.

A careful comparison of the single specimen secured by the *Albatross* shows that it agrees with the original description in every essential particular except in the matter of color, which is bright coral red with a white axis in the Hawaiian specimen. The color of the type specimen was yellowish red.

The colony bears a striking superficial resemblance to *Corallium*, and was mistaken for that when first seen.

Distribution.—Off the Island of Kauai: Station 4030, 423–438 fathoms (Cat. No. 25357, U.S.N.M.).

The original specimen was taken from the North Atlantic, off the coast of Norway.

Family SCLEROGORGIDÆ Wright and Studer.

Axis cylinder unjointed, composed of a horny substance and agglutinated calcareous spicules that are easily separated. Polyyps completely retractile.

Genus KEROEIDES Wright and Studer.

Calyces in the form of warty verrucæ, in two lateral rows. Spicules of axis smooth, spindle-shaped.

KEROEIDES GRACILIS Whitelegge.

Keroeides gracilis WHITELEGGE, Memoirs of the Australian Museum, III, Pt. 5, 1899, p. 308.

Quite characteristic specimens of this species were found in the Hawaiian material.

Distribution.—South coast of Molokai: Station 3838, 92–212 fathoms; Station 3853, 115–134 fathoms (Cat. No. 22563, U.S.N.M.); Station 3859, 138–140 fathoms.

Section **HOLAXONIA**.

Colony with an axis consisting of amorphous horny or calcareous material, or both, and not pierced by longitudinal canals, excepting a central one.

Family **ISIDÆ** Gray (modified by Wright and Studer).

Axis cylinder composed of alternating horny and calcareous joints, the latter not of fused spicules, but amorphous.

Genus **CERATOISIS** Percival Wright.

Branches, when present, arising from the calcareous joints of the axis cylinder. Polyps nonretractile, a circlet of diverging spicules around the oral region. Spicules smooth.

CERATOISIS FLABELLUM, new species.

Plate XLIII, fig. 1; plate XLVII, fig. 3.

All of the specimens were secured in a fragmentary condition. The largest piece is about 275 mm. long; calcareous nodes 17 to 27 mm. long, horny nodes $1\frac{1}{2}$ mm. long. The branches arise from the calcareous joints, on opposite sides of the stem; irregularly disposed but all in the same plane. Polyps on front and sides of stem and branches, unequally distributed, often denser on one side than on the other, standing at various angles with stem; about 4 mm. high, 2 mm. broad, cylindrical. The tentacles are folded loosely over the oral disk.

Spicules very long needles, attaining a length in some instances of 5 mm.; vertical in walls of calyces, on the distal portion of which they project upward as sharp points between the tentacle bases. The proximal part of calyx wall is overlaid with similar long needle-shaped spicules, often more or less obliquely disposed. Similar spicules are sparsely disposed in the cortex, where they are longitudinally disposed, and sometimes branched at one end, the two or three branches being parallel to the axis of the spicule.

The main stem and larger branches appear to be somewhat flattened. The polyps are distributed on all sides of smaller terminal branches, but are usually thicker on the edges.

Color.—Ivory white, the nodes purplish brown.

Type.—Cat. No. 25390, U.S.N.M., *Albatross* Station, unknown, Hawaiian Islands.

Distribution.—Off the coast of Kauai: Station 3998, 228–235 fathoms (Cat. No. 25391, U.S.N.M.).

Northeast coast of Hawaii: Station 4058, 190–195 fathoms (Cat. No. 22587, U.S.N.M.).

The largest specimen, taken as a type for the above description, was without a locality label.

CERATOISIS PAUCISPINOSA Wright and Studer.

Ceratoisis paucispinosa WRIGHT and STUDER, Report on the 'Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 28.

A fragmentary specimen with but four joints and the polyps much decomposed agrees fairly well with the original description of this species.

Distribution.—North coast of Molokai: Station 3904, 295 fathoms (Cat. No. 22584, U.S.N.M.).

The type specimen was taken by the *Challenger* off the coast of Japan, 345 fathoms.

CERATOISIS GRANDIS, new species.

Plate XLIII, fig. 2; plate XLIX, fig. 3.

Two fragments of the denuded axis measure, together, 437 mm., the indications being that the entire specimen was much longer. Calcareous internodes excessively elongated, none being certainly complete; measurements, 140 mm., 118 mm., 105 mm., and 70 mm. (the latter evidently broken). These internodes vary from 8 mm. to $2\frac{1}{2}$ mm. in diameter. There are but two horny internodes present, measuring 4 mm. and $2\frac{1}{2}$ mm. in length, the longer one being between the stouter calcareous internodes, and these latter are also the longest. All of the calcareous internodes have a distinct central canal.

The polyps were all detached from the axis, but were wrapped in a cloth with it. They are typical of the genus *Bathygorgia* of Wright and Studer, which is here included with *Ceratoisis*. Polyps large, slender-bodied, arising from a basal expansion and ending in an expanded distal part bearing the tentacles; length, $4\frac{1}{2}$ to 8 mm.; diameter below distal expansion 1 mm., across distal part $2\frac{1}{2}$ mm.; tentacles not fully retracted, but coiled over the mouth.

Spicules long, slender, sometimes slightly forked, rarely cruciform, often bar-like, sometimes approaching the needle-like form; apparently absent from the skin-like coenenchyma peeled from the axis; but slender spicules are present in the basal expansions of the polyps. Very large spicules surround the polyps, arranged vertically in the calyx walls, although they are often inclined to be more or less diagonal; strong spicules projecting up from the tentacle bases, and large

bar-like ones placed haphazard, as it were, on the tentacle bases, giving an exceedingly unkempt appearance. Small bar-like spicules are placed transversely on the distal parts of the tentacles.

Color.—Polyps straw yellow, stem ivory white, horny internodes very dark brown.

Type.—Cat. No. 22559, U.S.N.M., *Albatross* Station 4174, off Bird Island, 735–865 fathoms.

Genus LEPIDISIS Verrill.

Axis with long tubular calcareous joints, alternating with short horny ones from which the branches arise. An external layer of small scale-like spicules is found covering the large fusiform spicules.

LEPIDISIS LONGIFLORA Verrill.

Lepidisis longiflora VERRILL, Bull. Mus. Comp. Zool., XI, No. 1, 1883, p. 19.

A specimen taken by the *Albatross*, northwest coast of Oahu, at Station 4121, 316–251 fathoms (Cat. No. 25358, U.S.N.M.), agrees with the original description of this species.

The type and other specimens studied by Verrill were taken from four stations in the West Indies, at depths of from 461 to 805 fathoms.

Genus ACANELLA Gray (emended by Verrill).

Branches arising from the short horny internodes of the axis cylinder, spicules numerous in tentacles. No external layer of scale-like spicules.

ACANELLA EBURNEA (Pourtales).

Mopsea eburnea POURTALES, Bull. Mus. Comp. Zool., I, 1868, p. 132.

A specimen which I refer with doubt to this species was secured at Station 4121, northwest coast of Oahu, 216–251 fathoms. It is much broken, but was probably about 18 inches high. Branching very irregular, with a tendency to the formation of whorls. The polyp spicules were smaller than described by Verrill, but otherwise much the same.

The specimens studied by Pourtales and Verrill were taken from five stations in the West Indies, at depths of from 288 to 955 fathoms.

Family PRIMNOIDÆ Valenciennes (emended by Verrill).

Colonial forms with calcareous roots. Axis cylinder calcareous or horny, but never with alternating calcareous and horny joints. Calyces prominent, almost always with an operculum composed of eight scale-like spicules, and movable. Polyps often in whorls. Spicules usually scale-like.

Subfamily PRIMNOINÆ Versluys.

Operculum present. Scales large, not more than eight rows on polyp body, each row that is complete containing at least five scales.

Genus AMPHILAPHIS Wright and Studer.

Colony flabellate; calyces club-shaped, arranged in pairs on basal parts of branches, and irregularly distributed on distal parts.

AMPHILAPHIS BISERIALIS, new species.

Plate XLIII, fig. 3; plate XLVII, fig. 4.

The single fragment secured was 65 mm. high, and consisted of a stem or branch giving off alternate branches at intervals of about 18 mm.

The polyps are small, $1\frac{1}{2}$ mm. long, club-shaped, nearly straight, and form an acute angle with the stem or branch. They are strictly opposite on the main stem, and nearly always on the branches; but on the distal ends of the latter they are sometimes in whorls of three. The calyx walls are covered with large imbricating squamous spicules in about five whorls, and usually four longitudinal rows. Scales often ctenate on the distal edges and also often show undulating edges; surfaces often sculptured with radiating lines or furrows. Operculum nearly concealed, in side view, by the last whorl of body spicules, composed of broadly triangular scales, ribbed and fluted. Sometimes the alternate opercular scales are elevated and depressed, giving the appearance of two whorls of four each.

Spicules on stem and branches broad, scale-like, lamelliform, and much larger than in *Caligorgia gilberti*, which otherwise resembles this species. They are usually rounded, oval or ovate in outline.

Color light buffy throughout.

Type.—Cat. No. 22583, U.S.N.M., *Albatross*, station 3982, off Kauai, 40–233 fathoms.

Although this species does not quite agree with the definition of the genus *Amphilaphis*, it seems to me to belong here, the opposite disposition of the polyps making it necessary to remove it from *Plumarella*, to which it is closely allied.

The sculpturing of the scales seems to indicate a close affinity with *Caligorgia*, from which it is separated by the fact that the polyps are not appressed to the cortex, as in that genus.

AMPHILAPHIS REGULARIS Wright and Studer.

Amphilaphis regularis WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 71.

A single specimen in the Hawaiian collection is referred to this species.

Distribution.—Off French Frigate Shoal; Station 3973, 395–397 fathoms (Cat. No. 25386, U.S.N.M.).

Specimens were secured by the *Challenger* in the South Atlantic, near Tristan da Cunha, at a depth of 75 fathoms; and off Nightingale Island, 100–150 fathoms.

Genus *CALIGORGIA* Gray (emended by Studer).

Calyces bilateral, appressed to the cortex. Spicules scale-like, often with conspicuous sculpturing in the form of radiating ridges and ctenate edges.

CALIGORGIA GILBERTI, new species.

Plate XLIII, fig. 4; plate XLVII, fig. 6.

Colony (incomplete) about 325 mm. high. Main stem wavy in outline, giving off alternate branches which themselves often resemble the main stem and which give off alternate branchlets at intervals of about 18 mm. The whole colony is flabellate in form.

Calyces arranged in whorls of five (rarely four) to seven, rather closely approximated, club-shaped, with their inner sides appressed to the cortex. Height, $1\frac{1}{2}$ mm.

Spicules on calyx walls squamiform, numerous, with imbricating edges, distal edge often ctenate. The rows of scales are in annular whorls, and the more distal ones are often sculptured with radiating lines ending in the points which form the ctenate distal edges of the scales. Opercular scales eight, broad, flat, curved, the ventral ones not being notably smaller than the dorsal.

The distal ends of the polyps are bent strongly toward the cortex, so as to face the stem or branch.

Color.—Light yellow in alcohol. The fresh specimens were a bright corn yellow.

Named for Prof. Charles H. Gilbert, of Stanford University.

Type.—Cat. No. 25364, U.S.N.M., *Albatross* Station 4130, off Kauai, 283–309 fathoms.

Distribution.—Off Kauai: Station 3992, 528 fathoms (Cat. No. 25363, U.S.N.M.); Station 4130, 283–309 fathoms (Cat. Nos. 25364 and 25388, U.S.N.M.); Station 4132, 257–312 fathoms (Cat. No. 22592, U.S.N.M.); Station 4134, 225–324 fathoms. Off Hawaii: Station 4041, 382–253 fathoms.

Genus *STENELLA* Gray.

Polyps in whorls, with their calyces rigidly extending at right angles from branches. Body scales very large, in less than five rows, and very distinct from the opercular scales.

STENELLA HELMINTHOPHORA, new species.

Plate XLIV, figs. 6-9; plate XLVII, fig. 5.

Specimens much broken up. Colony evidently large, one stem being 13 mm. in diameter and densely calcareous. Branching not easily made out owing to the greatly broken condition of the specimens. Main branches irregularly distributed, branchlets dichotomously divided, with a tendency for the twigs to lie in the same plane.

Polyps irregularly distributed on main stem and branches, and in irregular whorls of four on the terminal twigs, length about 4 mm., shape cylindrical with a greatly expanded distal end, which flares like the mouth of a trumpet. The calyces project rigidly from the stem at right angles.

Spicules very large and squamiform, concave on cortex, with convexity resting on stem or branch, less concave on calyx where the scales are in about four whorls with three or four to a whorl. First whorl longest, often consisting of but two scales; third whorl shortest; the first, second, and third whorls forming a cylinder, but with their distal edges often elevated and more or less frilled. The distal whorl is much expanded at its margin, forming a cup composed of four scales (two larger and two smaller) inclosing the operculum. The operculum is composed of eight scales, each of which has a lamelliform raised edge, giving the appearance of eight vertical concentric plates. The operculum extends considerably beyond the calyx wall.

The spicules of the cortex are scale-like, fluted, often convex, with the convexity attached to the stem or branch.

Nearly all of the specimens were infested with an annelid, which had, by its presence, modified the first whorl of body scales so that they formed a sort of a tunnel, running along the branches, in which the annelid lived. These modified scales are enormously enlarged, two rows of them arching over and meeting each other above, forming an arcade. These arcades cover the greater part of one side of the branches in many specimens, and it is scarcely to be wondered at that Wright and Studer took this arcade or tunnel to be a normal structure.^a

In several specimens small simple-armed basket fish were excessively numerous, and these, too, seemed to have modified in some degree the cortex scales.

This species differs from *Stenella spinosa* in color of stem, and in having much more slender polyps; and from *S. johnstoni* in the number of whorls of spicules, and in the operculum.

^a Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873-1876, p. 53. Here the authors regard this structure as a generic character of the genus *Calypterinus*, an error that has already been corrected by Studer. (See Alcyonaires provenant des campagnes de l'Hirondelle, 1886-1888, 1901, p. 40.)

Type.—Cat. No. 25385, U.S.N.M., between Molokai and Maui: Station 3973, 32–37 fathoms.

Distribution.—Between Molokai and Maui: Station 3868, 294–685 fathoms (Cat. No. 25374, U.S.N.M.); Station 3973, 32–37 fathoms (Cat. Nos. 25317 and 25385, U.S.N.M.); Station 3974, 21–28 fathoms.

Off Bird Island: Station 4157, 762–1,000 fathoms.

The bathymetric distribution of this species is greater than of any other in the collection.

Subfamily CALYPTROPHORINÆ Versluys.

Spicules of calyx body reduced to two or three pairs of large scales. Operculum conspicuous, turned toward base of branch, and in contact with the branch when the polyp is retracted.

Genus STACHYODES Wright and Studer.

Calyx body armed with three pairs of large scale-like spicules; basal scales usually not entirely encircling the body.

STACHYODES ANGULARIS, new species.

Plate XLIII, fig. 7; plate XLVIII, fig. 1.

But a few fragments were secured, the largest being a branch about 125 mm. long, giving off regularly disposed unilateral branchlets, six in number, all in one plane.

Calyces arranged in verticils of four or five, which are closely approximated, but leave a part of the stem appearing between them. The calyces in this species appear to face upward, instead of downward as in the preceding species.

The calyx is composed of a series of three annular spicules, the proximal one being a short inconspicuous collar, incomplete on its inner side. The second has outer profile straight, outer side ending in two blunt lateral spines and very much longer than the inner side. The third or distal annular spicule is turned so as to form an acute angle with the second, its outer profile is straight, its lower edge is overlapped by the second, and its distal end is terminated by a round smooth margin.

Opercular scales thin and delicate, longer than in other species in the collection, and form a rather delicate turret or cone.

The spicules of the cortex are thin, lamelliform, and much smaller than those forming the calyces.

Color, in alcohol, white throughout; axis, where denuded, with a golden gloss.

Type.—Cat. No. 25346, U.S.N.M. The specimens of this species, in two bottles, had no locality label.

STACHYODES REGULARIS Wright and Studer.

A specimen of this species was dredged at Station 3879, south of Lanai Island, 923–1,081 fathoms. The original specimens were secured by the *Challenger* in the South Atlantic, near Tristan da Cunha, 75–150 fathoms.

STACHYODES DICHOTOMA Versluys.

Stachyodes dichotoma VERSLUYS, Die Gorgoniden der Siboga-Expedition, II, Die Primnoidæ, 1906, p. 88.

Several specimens referred to this species were secured by the Bureau of Fisheries steamer *Albatross*. Each specimen had coiled around its branches a simple-armed basket fish, probably belonging to the genus *Ophiocreas*. One specimen was 14 inches high.

Distribution.—Off Kauai: Station 3989, 388–500 fathoms (Cat. No. 22561, U. S. N. M.); Station 4013, 399–419 fathoms; Station 4030, 423–438 fathoms (Cat. No. 25376, U. S. N. M.); Station 4182, 671–957 fathoms (Cat. No. 25375, U. S. N. M.).

The species were secured by the Siboga Expedition in the Celebes Sea, off Menado, 1,264–1,165 meters; Kei Island, 204 meters; Arafura Sea, 984 meters.

STACHYODES BOWERSI, new species.

Plate XLIII, figs. 5, 6; plate XLVIII, fig. 2.

Colony about 225 mm. high. Basal portion white, solidly calcareous except at the center of axis; eight erect branches are given off immediately above the base, all of which shortly divide into three erect branchlets, some of which continue without further division, but most of which again branch dichotomously. All of the branches are erect and approximately parallel.

The calyces are in whorls of four, and face downward, each calyx bearing a series of whorls of broad scale-like spicules, two to a whorl, each whorl being strongly frilled and dentate on its outer (lower) margin, each being costate in a longitudinal direction, and each whorl overlapping its successor. One scale of each pair also overlaps its fellow laterally. The first, or upper whorl, is much broader in its dorsal part, narrows beneath into a mere collar or rim, and distally expands into a broadly frilled margin with four to seven jagged uneven teeth.

The second (middle) whorl is incomplete on its inner side, and its outer side is shorter than that of the first whorl; it ends in a frilled expanded margin in which the teeth are less prominent than in the first whorl. The third (distal or lower) whorl is the largest, and the margin is conspicuously frilled and dentate, or rather lobular, the teeth being less pointed than in the first whorl.

The operculum consists of eight delicate lamellar spicules which overlap laterally in regular order, reminding one of the blades of a turbine wheel; scales all of nearly the same size.

The height of the polyp, measuring directly and not around the curve, is 6 mm., and its diameter is about $2\frac{1}{2}$ mm.

The cortex spicules are long, delicate, flattened scales.

Color of stem and branches pale yellow, polyps pure white (in alcohol).

This species differs from *Stachyodes clavata* Versluys in having all three whorls of body scales about equally expanded and fluted.

Named in honor of George M. Bowers, the U. S. Commissioner of Fisheries.

Type.—Cat. No. 25377, U.S.N.M., *Albatross* Station 4153, near Bird Island, 962–1,059 fathoms.

Additional locality.—Off Niihau: Station 4174, 735–865 fathoms.

Genus CALYPTROPHORA Wright and Studer (emended by Versluys).

Calyx body with but two pairs of very large scale-like spicules, both of which usually, but not always, entirely encircle the polyp.

CALYPTROPHORA JAPONICA Gray. *

Calyptrophora japonica GRAY, Proc. Zool. Soc. London, 1866, p. 41.

Several specimens of this highly variable form were secured, most of which seemed to belong to *C. japonica* No. 3 of Versluys.^a

Distribution.—Between Maui and Molokai: Station 3882, 136 fathoms (Cat. No. 25369, U.S.N.M.).

Between Honolulu and Kauai: Station 4007, 508–557 fathoms (Cat. No. 25370, U.S.N.M.).

Between Molokai and Oahu: Station 4108, 411–442 fathoms.

This species was secured by the *Challenger* off the Fiji Islands, depth 610 fathoms; also by the *Siboga* expedition at several localities in the East Indies at depths varying from 12 to 1,264 meters.

The type is said to have come from the Japan Sea.

CALYPTROPHORA WYVILLI Percival Wright.

Calyptrophora wyvilli PERCIVAL WRIGHT, Narrative, Challenger Expedition, 1885, p. 690.

A very fine colony of this species was secured at Station 3997, off Kauai, 418–429 fathoms; also at Station 4019, off Kauai, 409 fathoms. Secured by the *Siboga* expedition from the Celebes Sea at a depth of 1,080–1,264 meters.

The *Challenger* secured the type from the West Pacific at a depth of 600 fathoms.

^a Die Gorgoniden der Siboga-Expedition, II, Die Primnoidae, 1906, p. 118.

CALYPTROPHORA VERSLUYSI, new species.

Plate XLIII, fig. 8.

Colony incomplete, about 250 mm. high, flabellate in general form, dividing near the base into four main branches, two of which remain undivided, and the others again divide each into four branches, one of which on each side gives off branchlets from its inner side only, the others being undivided or dichotomously branched.

Calyces arranged in whorls of four, except at the extreme bases of main branches, where there are six in a whorl, their opercula turned basally. The whorls are about 6 mm. apart from base to base.

Buccal pair of scales large, their distal ends with three to seven (usually four) large, jagged, irregular teeth, forming a complete ring. Basal scales with four (sometimes two) long slender spines, the four seeming to arise from the splitting of the original two. The spines vary greatly in younger specimens, the distal border of the buccal scales being merely scalloped, and there are but two spines to each basal scale.

Opercular scales eight, the abaxial and outer lateral being much longer and more flattened than the other four, which they overlap and almost conceal.

A pair of very small, almost linear, cortex scales abut against and overlap the basal scales on their proximal sides.

The cortex scales are thin, elongated, and irregular in form.

Color.—General color white, the axis appearing gray as seen through the cortex scales. The bare axis is a very dark brown, with a coppery luster.

This species is named in honor of J. Versluys, jr., the author of the report on the Gorgonacea of the *Siboga* expedition.

Type.—Cat. No. 25382, U.S.N.M., *Albatross* Station 4007, between Honolulu and Kauai, 508–557 fathoms.

Additional locality.—Off Kauai: Station 3997, 429 fathoms.

Family MURICEIDÆ Verrill.

Axis horny. Polyps without a true operculum, with a collarette of transverse spicules immediately below the tentacle bases. A pseudo-operculum is formed by the spicules on the tentacles, when the latter are folded. Œsophageal part of body wall without spicules, and retractile within the basal portion, which has spicules.

Genus ACANTHOGORGIA Gray (emended by Verrill).

Calyces elongated, cylindrical, expanded distally. Body spicules in eight longitudinal rows arranged *en chevron*, margins armed with eight bundles of sharp projecting spines.

ACANTHOGORGIA ARMATA Verrill.

Acanthogorgia armata VERRILL, Amer. Journ. Sci., XVI, 1878, p. 376.

It appears to me to be likely that the *Acanthogorgia spinosa* of Hiles^a is a synonym of this species. The specimens in the Hawaiian collection vary considerably among themselves.

Distribution.—Between Molokai and Oahu: Station 4107, 350–355 fathoms (Cat. No. 22556, U.S.N.M.).

Off Bird Island: Station 4156, 286–568 fathoms (Cat. No. 25381, U.S.N.M.).

Vicinity of Niihau Island: Station 4179, 378–426 fathoms (Cat. No. 22557, U.S.N.M.).

The original description was based on specimens taken from off the New England coast, from depths of 304 to 524 fathoms.

Genus PARAMURICEA K  lliker (emended by Verrill).

Bases of contracted tentacles bearing spicules arranged *en chevron*, forming an eight-rayed pseudo-operculum. Spicules of calyx walls forming eight longitudinal bands.

PARAMURICEA   QUATORIALIS Wright and Studer.

Paramuricea   quatorialis WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 100.

A specimen from Station 3859 (Cat. No. 25366, U.S.N.M.) agrees with the original description and figures except that the spicules are not so decidedly curved in our specimen, and do not show such decided “stachenplatten.” The calyces are exceedingly varied in form, from a truncated cone to a short cylinder.

The figures in the *Challenger* report do not agree with the description in the text as to the proportion of height to diameter of the polyps.

The type specimens were taken by the *Challenger* near St. Pauls Rock, South Atlantic, from a depth of 80 fathoms.

PARAMURICEA HAWAIIENSIS, new species.

Plate XLIV, fig. 1; plate XLVIII, fig. 3.

Colony large, robust, flabellate in outline, incomplete, 200 mm. in height. Main stem about 8 mm. in diameter, irregularly bent, giving off irregularly spaced lateral branches which resemble the main stem; branches showing a tendency to branch on one side only, but in some cases the distal branchlets are alternate; branch terminations abruptly enlarged and usually bearing a group of two to four laterally placed polyps.

^a Zoological Results of the Willey Expedition, Pt. 2, p. 113.

Polyps irregularly but sparsely scattered over main stem and larger branches, more approximate on distal parts, where they often become quite regularly alternate; those on the same side being about 3 mm. apart. They project at a right angle from the branches and are 2 to 3 mm. high to the end of the operculum, varying from a rough cylinder to the frustum of a cone in shape; average diameter below collar about 2 mm.

Spicules warty spindles, large and stout, often forked or branched, arranged in circles at bases of the calyces, and vertically placed in the calycular walls without forming eight longitudinal costæ that are as distinctly marked as in other species of this genus. At the margin a few not very prominent points arise. The collar is quite well marked, and is composed of rather slender spindles with inconspicuous verrucæ or none. The opercular spicules are slender, curved, warty spindles, covering the dorsal side of the tentacles in longitudinal bundles of four to eight. Spicules of the cœnenchyma rough, coarse spindles arranged longitudinally, in a general way, but often more or less irregular in disposition.

Color of main stem and branches dark golden brown. The rest of the colony is grayish brown.

Type.—Cat. No. 25353, U.S.N.M., *Albatross* station 4186, off Kauai, 508–682 fathoms.

Genus ANTHOMURICEA Wright and Studer.

Calyces cylindrical, projecting perpendicular to the axis. Spindle-shaped spicules arranged *en chevron* both on body walls and on proximal parts of tentacles.

ANTHOMURICEA TENUISPINA, new species.

Plate XLIV, fig. 2; plate XLVIII, fig. 5.

Colony flabellate in form, attaining a height of about 375 mm., growing from a basal disk-shaped concave flap of leathery consistency. Stem 7 mm. thick, almost straight proximately and sinuous distally, giving off large and small branches on opposite sides; branches subdividing several times, sometimes giving off regularly opposite twigs, and at others showing no regularity whatever.

Polyps scattered sparsely on the main stem and branches, more crowded distally. On the branchlets they are arranged in irregular whorls of three or four, and are only about 2 or 3 mm. apart. The twigs end in a broad lobular expansion on which is placed a group of three to five polyps.

Calyces low truncated cones. The polyp is greatly constricted just below the collar, and above it the tentacles arise in a perpendicular group, the outline of the mass of tentacles being a truncated oval when viewed laterally. Height of polyp and calyx about 2 mm.

Spicules, small warty spindles disposed transversely around the bases of the calyces, and in eight double rows arranged *en chevron* in their walls. Those of the collar are more slender and curved at the ends; while those of the tentacles are much smaller, more slender, arranged *en chevron* basally, but distally they are disposed in numerous more nearly parallel longitudinal rows. The spicules of the cortex are sometimes scale-like, but are usually stout warty spindles, sometimes very irregular in their disposition, at others longitudinally disposed.

Color.—Stem and branches, where bare, a dark rich brown; polyps a much lighter yellowish brown. When dried, the spicules of the cortex give the colony a silvery appearance.

This is one of the largest and handsomest species in the collection.

Type.—Cat. No. 25383, U.S.N.M., *Albatross* Station 4178. Near Niihau Island, 319–378 fathoms.

Genus CLEMATISSA Wright and Studer.

Termination of branch always formed by a polyp. Calyces bluntly conical, arranged in short spirals. Spicules exceedingly varied in shape, those in calyx walls arranged irregularly, those on tentacle bases *en chevron*.

CLEMATISSA ALBA, new species.

Plate XLIV, fig. 4; plate XLVIII, fig. 4.

Colony incomplete, about 22 mm. high, consisting of a sinuous stem giving off two large unequal branches about 50 mm. apart. The branches and main stem are equal in diameter and similar in appearance, each ending in an irregular cluster of polyps. The calyces are disposed in an irregular spiral, project at a right angle from the stem and branches, although their distal ends may be inclined either toward the distal or proximal end of the colony; unusually large in size, cylindrical, sometimes attaining a height of $5\frac{1}{2}$ mm. to the top of the operculum, and a diameter of 3 mm. across the top of the calycular wall. The tentacular part of the polyp is abruptly constricted from the body, and is quite high; the basal half of the tentacles being held vertically, and the distal half bent abruptly over the oral disc.

The spicules are warty spindles, sometimes flattened and branched. Those of the calyx walls are proportionally small and inclined in all

directions, there being no regularity whatever. The collaret is distinct, formed of annularly disposed spicules. The opercular spicules are in bundles of a dozen or more, parallel and vertical, rather short with blunt ends, arranged *en chevron* at the very bases of the tentacles. Spicules of the cortex with a tendency toward a longitudinal arrangement, although there is much irregularity in their disposition.

Color.—The axis, cortex, and calyces are all creamy white in color (in alcohol), so that the colony bears a striking resemblance to a coral.

Type.—Cat. No. 25378, U.S.N.M., *Albatross* Station 4157, off Bird Island, 762–1,000 fathoms.

CLEMATISSA TENUE, new species.

Plate XLIV, fig. 3; plate XLIX, fig. 2.

Colony straggling in habit, attaining a height of 150 mm., sometimes unbranched and at others very sparsely branched. In one specimen there are two very short branches very distant from each other, and in others there are several long, straggling, irregularly disposed branches.

Calyces arranged in rather irregular spirals which grow closer toward the distal ends of the branches. Branches terminating in a polyp. The calyces are very low dome-shaped, spreading at their bases, which are often contingent.

Polyps, when expanded, arising abruptly from the summit of the calyx, where they assume the form of a miniature acorn; sometimes the polyp is greatly elongated and the tentacles are extended and not folded over the mouth as usual, but generally the attitude is the characteristic one of the family. The expanded polyp shows eight longitudinal bands of warty spicules.

Spicules usually small, exceedingly varied in shape. Those of the coenenchyma are almost scale-like in appearance, and their outer edges seem to overlap the inner edges of those in the next row; edges jagged and irregular. The spicules of the calyx walls are similar to those just described. The collaret is evident, the spicules at the bases of the tentacles are warty spindles arranged *en chevron*, and the remainder of the tentacular spicules are longitudinally arranged. There are many warty spindles in the cortex, often with projections on one side, sometimes curved or branched.

Color.—Gray.

Type.—Cat. No. 22569, U.S.N.M., *Albatross* Station, 4102, between Molokai and Maui, 122–132 fathoms.

Distribution.—Between Maui and Molokai: Station 3856, 127 fathoms (Cat. No. 22566, U.S.N.M.); Station 3857, 127–128 fathoms (Cat. No. 22570, U.S.N.M.); Station 3858, 128–138 fathoms; Station 3859,

138-140 fathoms (Cat. No. 22567, U.S.N.M.); Station 3862, 108-127 fathoms (Cat. No. 22565, U.S.N.M.); Station 3864, 163-198 fathoms; Station 4102, 122-132 fathoms (Cat. No. 22569, U.S.N.M.).

CLEMATISSA VERRILLI Wright and Studer.

Clematissa verrilli WRIGHT, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873-1876, 1889, p. 107.

A fragmentary specimen taken off the north coast of Maui, at Station 4098, 95-152 fathoms (Cat. No. 22593, U.S.N.M.), is referred to this species.

The type was secured by the *Challenger* off Tristan da Cunha Island, from a depth of 360 fathoms.

Genus MENELLA Gray.

Colony unbranched; calyces on all sides of stem, closely set; polyps retractile, in retraction leaving an oblong concavity at the summit of the calyx.

MENELLA GRANDIFLORA, new species.

Plate XLIV, fig. 5; plate XLVIII, fig. 6.

Colony an unbranched stem arising from a disk-like leathery base, attaining a height of 256 mm. and a diameter of $3\frac{1}{2}$ mm. The stem is slightly expanded at the distal end, making it somewhat club-shaped.

Polyps very large, rather thickly implanted on the sides, and more closely on the front and back of stem. Calyces in form of truncated cones $3\frac{1}{2}$ mm. high and $5\frac{1}{2}$ mm. broad at base, elliptical in section. The polyp is often considerably exerted above the calyx, so that the height of polyp and calyx together may be 7 mm.

Spicules large warty, sometimes forked, disposed irregularly around the base of the cone, with a tendency toward a circular arrangement. They form eight vertical bands on the calyx walls; those of each band being *en chevron* basally and more nearly vertical distally, their ends projecting above the margins of the walls.

The oesophageal region of the polyp is much more extensive than usual in this family, and is surrounded by a number of rugosities consisting of transversely disposed spicules, the upper rugosity forming the collaret. Above this arise the tentacular spicules, disposed *en chevron* basally and in several longitudinal rows distally. The tentacles are erect and not distinctly folded over the mouth.

Color of axis very dark brown, in places, with greenish golden iridescence; polyps very light brownish yellow, in alcohol.

Type.—Cat. No. 22590, U.S.N.M., *Albatross* Station 3992, off Kauai, 528 fathoms.

Genus *ECHINOMURICEA* Verrill.

Calyces short, cylindrical, conical or truncated; tentacular opercula horizontal; spicules long flat needles; with branched ends.

ECHINOMURICEA BRUNNEA, new species.

Plate XLV, fig. 1; plate XLIX, fig. 4.

Colony incomplete, flabellate in form, attaining a height of about 75 mm., consisting of a central stem which branches in a straggling manner.

Calyces usually borne on opposite sides of stem and branches, but in places on all sides, low, dome-shaped, and about 2 mm. high by $2\frac{1}{2}$ mm. broad at base.

Polyps completely retractile, so that there is not even a distinct opening at the top of the calyx.

Spicules small, of exceedingly varied form, many being spindle shaped with both ends branched and forked, some being star shaped, and some resembling the paxillæ of starfish in miniature. They cover the surface of calyces and cortex, looking much like grains of sand under the dissecting lens. There is a circlet of pointed spicules around the top of the calyx at the margin of inversion, and there are a few large warty spindle-shaped spicules arranged *en chevron* on basal part of tentacles and longitudinally on distal part.

Color.—A uniform sandy brown.

Type.—Cat. No. 25325, U.S.N.M., Station 4079, between Hawaii and Maui, 143–178 fathoms.

Distribution.—South coast of Molokai: Station 3838, 92–212 fathoms (Cat. No. 22596, U.S.N.M.).

Between Molokai and Maui: Station 3859, 138–140 fathoms; Station 3863, 154 fathoms (Cat. No. 25420, U.S.N.M.); Station 3885, 136–148 fathoms (Cat. No. 25327, U.S.N.M.); Station 4100, 130–151 fathoms (Cat. No. 25328, U.S.N.M.).

Between Hawaii and Maui: Station 4079, 143–178 fathoms (Cat. No. 25325, U.S.N.M.).

This species bears much superficial resemblance to the Gorgonidæ, but is distinctly amuriceid, and appears to belong to this genus, as is shown by the arrangement of spicules in the polyps.

Genus *CYCLOMURICEA*, new genus.

Colony flabellata; calyces short, stout, columnar, their walls with spicules transverse to the axis of the calyx and forming annular rings around it. Spicules warty spindles.

Type.—*Cyclomuricea flabellata*.

CYCLOMURICEA FLABELLATA, new species.

Plate XLV, figs. 2 and 3; plate XLIX, fig. 1.

Colony (fragmentary) 65 mm. high, flabellate in general form. Main stem giving off irregularly spaced branches from opposite sides, and then dividing into two branches about 25 mm. from the base; these latter branches giving off branchlets from one side only; the branchlets again dividing, in some cases giving off terminal twigs from both sides.

Polyps irregularly distributed on opposite sides of main stem, but becoming more closely approximated on the smaller branches and twigs, where the distance between adjacent polyps is about 1 mm. The calyces are inclined distally and bend slightly at the ends. They are short, stout, columnar, about 1 mm. high, and their diameter is about equal to their height. The œsophageal region is not well differentiated.

Spicules, warty spindles, many of them rather slender, sometimes forked, but usually fairly symmetrical. Those in the calyx walls are transversely disposed, this disposition making it hard to differentiate the collar from the rest of the polyp, the spicules having the same form and disposition. The tentacular spicules are of the same warty form; several at bases of the tentacles converging distally *en chevron*, but longitudinally arranged on the rest of the tentacle.

Color.—Axis dark brown; polyps lighter brown, in alcohol.

Type.—Cat. No. 25331, U.S.N.M., *Albatross* Station 4161, off Bird Island, 39–183 fathoms.

Genus MURICELLA Verrill.

Cœnenchyma thin; calyces short, subconical; spicules warty spindles.

MURICELLA TENERA Ridley.

Muricella tenera RIDLEY, Zoological Collections of H. M. S. Alert, 1884, p. 335.

The specimens secured by the *Albatross* agree better with the descriptions of those secured by the *Challenger* than with the original descriptions of Ridley, especially regarding the disposition of the spicules on the calyx walls. The calyces are exceedingly variable in size.

Distribution.—South coast of Molokai: Station 3854, 130–134 fathoms (Cat. No. 25373, U.S.N.M.).

Type-Localities.—Port Molle, Queensland.

The *Challenger* specimens were secured off the Ki Islands, Papua.

Family CHRYSOGORGIDÆ Verrill.

Cœnenchyma thin, polyps large, usually distant, in a single row and nonretractile; base of attachment calcareous. Calyces not evident as separate from the polyp walls, to the shape of which they strictly conform; no opereulum nor collaret. Axis, when denuded, generally with a brilliant metallic lustre.

Subfamily LEPIDOGORGINÆ.^a

Colony simple, unbranched, slender; polyps in a single row.

Genus LEPIDOGORGIA Verrill.

The characters of the genus are the same as those of the subfamily.

LEPIDOGORGIA GIBBOSA, new species.

Plate XLV, fig. 6; plate XLIX, fig. 5.

The unbranched stems arise singly or in tufts from a fibrous mass of rootlets which is small in comparison to the size of the stems; height 150–200 mm.

Stem flexible, slender, covered with a thin cœnenchyma; bearing equidistant and unilateral polyps inclined toward the distal end.

Polyps 27 mm. apart, emplaced along the whole length of the stem; rather short, arising from a distinct swelling, which is larger than the polyp body itself and embraces the stem. The polyp body is sharply distinguished from this swelling, very short, being but about 1 mm. in height to tentacles; tentacles very long and thread-like, nonretractile, with long filamentous fringes. The tentacles are very difficult to measure, on account of their being loosely coiled, but they are at least twice as long as the polyp body.

The spicules are small, rod-like, sometimes cruciform, rather sparsely distributed, longitudinally placed on polyp body, thickly distributed on the basal swelling and the cortex, apparently absent in the tentacles. Those of the cortex are scale-like and lobed in various ways. All spicules are without pronounced verrucae.

Siphonozoids are present in this species, between the basal swellings.

Color.—Light buffy yellow, the bared stems showing a dull golden iridescence.

Type.—Cat. No. 25330, U.S.N.M., *Albatross* Station 3990, off Kauai, 296–326 fathoms.

Additional locality.—Off Kauai: Station 3989, 165–469 fathoms (Cat. No. 25372, U.S.N.M.). Numerous specimens.

^a The arrangement of subfamilies, genera, and subgenera here adopted is substantially that of Versluys in his excellent monograph of the Chrysogorgiidae of the *Siboga* expedition.

LEPIDOGORGIA SPIRALIS, new species.

Plate XLV, fig. 5.

Colony unbranched, attaining a height of 4 feet 6 inches (135 cm.). Stem bending on its ascent in the form of a helix, exceedingly slender and growing more so distally, until it is not much larger than a coarse hair. Root absent.

Polyps uniserial, small, short, inclined toward distal end of stem, placed at intervals of about $3\frac{1}{2}$ mm.; basal portion of polyp consisting of a long swelling embracing the stem, from the distal and lateral angle of which the polyp proper arises. Length of polyp, from tentacle bases to branch, $1\frac{1}{2}$ mm.; diameter about 1 mm.

There appear to be no spicules whatever in this species.

Color.—Straw yellow, in alcohol, axis with indistinct violet and purple reflections.

The spiral coiling of the stem may possibly be due to the manner in which it was packed in a can for transportation; but the "set" appears to be natural.

The entire absence of spicules appears to be a feature not before met with in this family. The presence or absence of spicules does not seem to be a good character for even generic definition in this order.

Type.—Cat. No. 25355, U.S.N.M., *Albatross* Station 4103, between Maui and Molokai, 132–141 fathoms.

Subfamily CHRYSOGORGINÆ.

Colony branched; the branches simple or branched, branches often spirally arranged; cortex thin; tentacles capable of but partial retraction; spicules sparsely distributed.

Genus CHRYSOGORGIA Verrill.

Branches geniculate, giving off branchlets, all of which are from the same side of the branch. Stem sympodial, the branches being given off in a spiral. Tentacles never truly retractile.

"Group A," Versluys.

Polyps with spicules in body and tentacles that are shorter or longer bar- or needle-shaped, with rounded or pointed ends, and with surfaces covered with nodules; "schuppen" or scales are also present. Exceptionally the body spicules are slender, but usually longer than broad, sometimes with very few nodules, and all lying lengthwise in the distal part of the body.

CHRYSOGORGIA ARBORESCENS, new species.

Plate XLV, figs. 4 and 8; plate XLIX, fig. 6.

Height of incomplete colony 162 mm. The main stem divides into two equal main branches about 25 mm. from the bottom; branch

origins two-fifths, right-handed.^a The distance between branch origins is about 3 mm., and the slightly ascending branches subdivide about four times. Normal polyps ordinarily one to each node, but two to a node on distal parts; small, rather slender, $1\frac{1}{2}$ to 2 mm. high. Besides these there are a number of large abnormal polyps infested with parasitic crustacea. These polyps are in some cases as much as 12 mm. high by 2 mm. in diameter.

Spicules, usually bar-like, arranged longitudinally on body walls and in tentacles. Not seldom irregular, branched forms are seen. The spicules in the modified polyps are larger than elsewhere, and tend to be more irregular. Here also they are arranged longitudinally in the body walls.

Color of main stem light drab, main branches light yellow, polyps almost white. It is probable that the branches and polyps are bright yellow in life.

The stem has a dull greenish iridescence, where denuded, and this becomes lighter green where the axis of the branches is seen.

Type.—Cat. No. 25354, U.S.N.M., *Albatross* Station 3973, near French Frigate Shoal, 395–397 fathoms.

Additional locality.—Between Hawaii and Maui: Station 4065, 491–500 fathoms.

CHRYSOGORGIA DELICATA, new species.

Plate XLV, fig. 7.

Colony, incomplete, about 50 mm. in height, with exceedingly delicate stem and branches, the latter with but one or two bifurcations. Spiral left-handed, one-third to a whorl; distance between branch origins 4 mm.

Polyps about $2\frac{1}{2}$ mm. high, quite distant from each other, a single one to a node, except where there are two on a distal node, much decomposed and hard to study in the specimens secured.

Spicules squamiform, but so varied in form and size as to be almost beyond description. They are rather large, with many lobular processes from their edges, and are imbricating and interlocked in an exceedingly complex manner. They often have forked, lobular ends, resembling those of *C. axillaris*. Their general trend seems to be longitudinal in polyp walls, although there is a tendency to become transverse on the polyp bases. Tentacular spicules curved, placed transversely.

^a These terms are used by Versluys. "Branch origins two-fifths" means that starting with a given branch origin, and following the origins of successive branches upward, the sixth branch origin will be directly above the first, and that the spiral traced through the branch origins will have passed meanwhile twice around the stem. "Right-handed" means that the spiral passes upward in an opposite direction to that taken by the hands of a watch.

Color.—Almost white throughout. Where the axis is bare it shows a violet iridescence.

The species is not far from "*Chrysogorgia* sp.?" Versluys,^a with which it agrees in the details of the polyp spicules.

Type.—Cat. No. 25332, U.S.N.M., *Albatross* Station 4166, near Bird Island, 293–800 fathoms.

CHRYSOGORGIA ELEGANS (Verrill).

Plate L, fig. 1.

Dasygorgia elegans VERRILL, Bull. Mus. Comp. Zool., XI, No. 1, 1883, p. 23.

Several specimens referable to this species were secured.

Distribution.—Between Molokai and Maui: Station 3866, 283–284 fathoms (Cat. No. 25339, U.S.N.M.).

North coast of Molokai: Station 3911, 334–337 fathoms; Station 3917, 294–330 fathoms (Cat. No. 25338, U.S.N.M.).

The material studied by Verrill was secured off Granada, 291 fathoms, and off Barbados, 237–347 fathoms.

CHRYSOGORGIA FLEXILIS (Wright and Studer).

Plate XLVI, fig. 1; plate L, fig. 6.

Dasygorgia flexilis WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 10.

Several fine colonies of this species were secured during the Hawaiian cruise.

Distribution.—Between Molokai and Maui: Station 3868; 294–684 fathoms. (Cat. No. 25340 U.S.N.M.)

Between Maui and Molokai: Station 3901, 280–311 fathoms (Cat. No. 25341, U.S.N.M.).

North coast of Molokai: Station 3925, 299–323 fathoms.

The specimen from Station 3868 differs from the others in having more slender polyps, and in having a brighter golden iridescence to the distal parts of the denuded stem and branches.

This species was collected by the *Challenger* off the coast of Chiloe, at a depth of 120 fathoms.

CHRYSOGORGIA LATA Versluys.

Plate XLVI, fig. 2; plate LI, fig. 3.

Chrysogorgia lata VERSLUYS, Die Gorgoniden der Siboga-Expedition, I, Die Chrysogorgiidae, 1902, p. 33.

Chrysogorgia lata. A beautiful colony, about 2 feet in height, was secured at Station 4137, off Kauai, 411–476 fathoms.

Other localities, Station 3989, off Kauai, 385–500 fathoms, and Station 4187, off Kauai, 508–703 fathoms. (Cat. No. 25387, U.S.N.M.)

^a Die Gorgoniden der Siboga Expedition, I, Die Chrysogorgiidae, 1902, p. 78.

The type was secured by the *Siboga* expedition in the Celebes Sea at a depth of 1,901 meters.

CHRYSOGORGIA SPICULOSA (Verrill).

Dasygorgia spiculosa VERRILL, Bull. Mus. Comp. Zool., XI, No. 1, 1883, p. 23.

A single specimen, collected off Bird Island, at Station 4151, 313–800 fathoms (Cat. No. 25356, U.S.N.M.), agrees better with the description in the *Challenger* report (p. 91) than it does with Verrill's original description.

The material studied by Verrill was secured at five West Indian stations, from depths varying from 334 to 573 fathoms. The *Challenger* secured this species off Pernambuco, from a depth of 350 fathoms.

“Group B, *SQUAMOSÆ ABERRANTES*,” Versluys.

Polyps with very thin squamous spicules only in the body. Tentacular spicules very thick and irregular scales, sometimes terete spicules.

CHRYSOGORGIA CURVATA Versluys.

Plate XLV, fig. 9.

Chrysogorgia curvata VERSLUYS, Die Gorgoniden der Siboga-Expedition, I, Die Chrysogorgiidae, 1902, p. 67.

An incomplete colony from near Bird Island, Station 4153, 962–1,059 fathoms (Cat. No. 25371, U.S.N.M.), shows the characteristics of this species very well, although it differs from the type in having longer internodes, and the tentacular spicules do not show such jagged ends as are figured by Versluys. It is doubtless the same species, however.

Distribution.—The type was secured by the *Siboga* expedition between Halmahera and Gebe, from a depth of 1,089 meters.

CHRYSOGORGIA FLAVESCENS, new species.

Plate L, fig. 5.

The fragments of a large colony indicate an original height of about 16 inches (40 cm.). Stem smooth, straight, and unbranched for about 250 mm., distinctly geniculate at branch origins. Branch origins one-third, left-handed, rather distant for this genus, being about 12 mm. apart. Branches dividing four or five times. Polyps, one to each internode of branches, rather distant, about $2\frac{1}{2}$ mm. high, with bulging basal and constricted middle portions, projecting at nearly a right angle from the branches.

Zooids are present on the branches.

Spicules squamiform, with lobulated edges, transverse on body wall and on the outer surfaces of the tentacles, forming an imbric-

cating armor. This imbrication is formed by the lobulated upper edges of the scales overlapping the smoother edges of those just above. The spicules of the cortex are larger lobulated scales, longitudinally disposed. Occasional cruciform scales are seen.

Color.—Buff yellow, with a bright golden iridescence where the cortex is removed from the axis.

Type.—Cat. No. 25379, U.S.N.M., *Albatross* Station 4125, between Oahu and Kauai, 963 fathoms.

Additional locality.—South of Lanai: Station 3879, 923–1,081 fathoms.

The specimens from Station 3879 are mere fragments, and have larger terminal polyps than the type. The single specimen which forms the type is so fragmentary that I do not feel justified in dissecting the stem to find whether it is monopodial or not. From its mode of growth, and long, smooth, straight basal part of the stem, I suspect that it may belong to the next genus, *Metallogorgia*.

CHRYSOGORGIA GENICULATA (Wright and Studer.)

Plate L, fig. 4.

Dasygorgia geniculata WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 17.

This species shows the highly modified polyps referred to on page 589 that seem to be the result of the presence of parasitic crustacea in the polyp cavities.

Some of these polyps are 7 mm. long, while the normal polyps are but a little less than 2 mm. long.

The station number of this specimen is lost. (Cat. No. 25360, U.S.N.M.) * The types were taken by the *Challenger* off the Philippines from a depth of 80 to 102 fathoms, and off the Japanese coast. The species was also secured by the *Siboga* expedition, off Kei Island from a depth of 148 to 621 meters.

CHRYSOGORGIA STELLATA, new species.

Plate XLVI, fig. 3; plate L, fig. 3.

Colony profusely branched, flabellate in general form, 150 mm. high by 125 mm. in spread. Root, a round, flat white calcareous plate. Main stem stout, beginning to branch 6 mm. from the root; first three branches tending to form a spiral $5\frac{1}{4}$ mm. apart; then a large, much divided branch is given off; then a smaller branch; and then the stem divides into a bushy tuft of large branches, each being erect and much divided, there being from seven to ten divisions of each.

Polyps usually two to each node on distal parts, and one to each node on proximal parts of branches, inclined toward distal parts of

branches; 4 mm. high, $2\frac{1}{2}$ mm. broad across crown of spines. Basal part of polyps rather broad, the calyces expanding above into eight broad conspicuous spines composed of spicules longitudinally arranged, and pointing radially outward and upward, so that the whole affair has a pronounced stellate outline when viewed from above.

Spicules usually smooth, without verrucæ, but often with lobular processes. On the bases of the polyps they are obliquely arranged; higher up they are transverse, there being two horizontal series between the ridges under the tentacle bases, forming a concave surface to which the spicules conform. Just above and inside of each of the spines referred to above, a band of imbricating squamiform spicules in several indefinite rows passes along the dorsal surface of each infolded tentacle. The cortex contains an outer layer of long terete spicules, and an inner layer of smaller, scale-like forms.

The color of the entire colony is a brilliant golden yellow when fresh. The exposed surface of the axis shows a particularly brilliant golden luster, like highly burnished gold.

Type.—Cat. No. 25380, U.S.N.M., *Albatross* Station 3826, south coast of Molokai, 371 fathoms.

Additional locality.—Between Molokai and Oahu: Station 4107, 355 fathoms.

This species is near *Chrysogorgia octagonus* Versluys^a but the branching is much more profuse, the angles at tentacle bases are acute, and the arrangement of body spicules different.

Genus METALLOGORGIA Versluys.

Branches irregular, distant or absent in proximal part of the colony; on distal part they form a pannicle. Stem monopodial.

METALLOGORGIA MELANOTRICHOS (Wright and Studer).

Plate LI, fig. 5.

Dasygorgia melanotrichos WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873–1876, 1889, p. 15.

Several fine specimens of this species were secured during the Hawaiian cruise. One of these from Station 4018 had a smooth unbranched stem 32 inches (80 cm.) long, surmounted by a graceful pannicle or crown of branches.

Distribution.—Off Kauai Island: Station 4018, 724–804 fathoms. Near Kauai Island: Station 4016, 305–318 fathoms (Cat. No. 25367, U.S.N.M.).

Off Bird Island: Station 4157, 100–762 fathoms (Cat. No. 25384, U.S.N.M.).

^a Die Gorgoniden der Siboga-Expedition, I, Die Chrysogorgiidae, 1902, p. 65.

The type was secured by the *Challenger* off Ascension Island, 425 fathoms.

The *Siboga* expedition secured the species from Ternate and south of Timor at depths of 765 to 1,994 meters.

METALLOGORGIA SQUARROSA (Wright and Studer).

Plate LI, fig. 4.

Dasygorgia squarrosa WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873-1876, 1889, p. 14.

A number of colonies which agree almost exactly with the original description of this species were collected during the Hawaiian cruise. The mode of growth is the characteristic one for this genus, to which I therefore refer the species.

Distribution.—South coast of Molokai: Station 3828, 281-319 fathoms (Cat. No. 25335, U.S.N.M.).

Off Kauai: Station 3992, 528 fathoms (Cat. No. 25349, U.S.N.M.); Station 3997, 418-429 fathoms (Cat. No. 25350, U.S.N.M.); Station 4003, 406-751 fathoms (Cat. No. 25336, U.S.N.M.); Station 4016, 305-318 fathoms.

Between Molokai and Oahu: Station 4107, 350-355 fathoms.

The type was secured by the *Challenger* south of the Philippine Islands, depth 500 fathoms.

Genus IRIDOGORGIA Verrill.

Axis growing in the form of an upright spiral. Branches simple, long, slender, arranged on one side of the heliciform stem: their bases therefore being inserted in a helix.

IRIDOGORGIA BELLA, new species.

Plate XLVI, fig. 4; plate LI, fig. 1.

The incomplete stem is 325 mm. in actual length, but coiled in such a close helix that the actual height of the colony is only 93 mm. Stem thick and wire-like in structure, very different from the preceding species, bearing a series of closely approximated simple branches on one side, the outer. Branches 4 mm. apart, equally spaced, gracefully curved, about 112 mm. in length. They were almost all stripped from the stem, but apparently they all belonged to the same specimen; only five of them remained normally attached.

Polyps uniserial, 7 mm. apart, each arising from a long swelling which embraces the branch, cylindrical, inclined toward the distal end of the branch, proximal end smaller than the distal, about $2\frac{1}{2}$ mm. high. The tentacles are matted together over the tops of the

polyps so that their form is difficult to ascertain. They do not appear to be retractile.

Spicules long or needle-like, or bar-shaped, sometimes slightly branched; arranged vertically in body walls, where they are thickly packed, and distally forming eight broad longitudinal bands ending at points between the tentacle bases. The tentacular spicules are longitudinal.

Zooids are rather sparsely scattered over the upper sides of the branches.

Type.—Cat. No. 25359, U.S.N.M., *Albatross* Station 4019, near Kauai Islands, 405–550 fathoms.

The close helix into which the stem is coiled, together with the very stiff and wiry texture, are the chief diagnostic features of this species.

IRIDOGORGIA SUPERBA, new species.

Plate XLVI, fig. 5; plate L, fig. 2.

Two pieces of an incomplete specimen measured, together, 5 feet $\frac{1}{2}$ inch. Main stem stout, brittle, straight on all but distal portion where it becomes wavy; its whole length marked by the regular branch origins arranged in a spiral, or helix. In the proximal part each turn of the helix, measured vertically, is 17 mm., in the distal part it is 24 mm. The adjacent branch origins are 2 to 3 mm. apart. There are a few scattered polyps on the stem. The branches are slender, unbranched and gracefully curved, 125 to 175 mm. in length.

Polyps unilateral in arrangement, on the upper sides of the branches, 5 to 6 mm. apart, arising from a long swelling basal portion which is parallel to the axis of the stem. Above this swelling the body is short and stout, bearing very long, nonretractile tentacles. Length of basal swelling, $2\frac{1}{2}$ mm.; height, 1 mm. Diameter of body above basal swelling, $1\frac{1}{2}$ mm.; height, 1 mm.; length of longest tentacle (in alcohol), 6 mm.

Zooids are distributed in groups along the branches, sometimes being aggregated near the polyp bases.

The spicules are remarkably uniform in size and shape, being in the form of rather slender smooth bars with rounded ends, somewhat constricted in the middle. They are found longitudinally disposed in the cortex of the branches, and transversely disposed in the expanded bases of the polyps. The remainder of the polyps and the tentacles appear to be without spicules.

The color of the main stem is grayish yellow; branches and polyps bright corn yellow. The iridescence of the exposed axis is brilliant green.

Type.—Cat. No. 25316, U.S.N.M., *Albatross* Station 3989, off Kauai, 385–500 fathoms.

This was the handsomest alcyonarian that the writer has ever seen as it came up in the trawl. Nothing could be more graceful than the arrangement and attitude of the slender, symmetrical branches.

The species differs from *Iridogorgia pourtalesii* in having more closely approximated branches, shape, and spiculation of polyps, as well as in size.

Subfamily RIISEINÆ.

Colonies branched; twigs borne on only one side of branches; cortex and polyp walls thick; tentacles capable of retraction within the body cavity.

Genus PLEUROGORGIA Versluys.

Colony palmate; branchlets in a straight row on one side of branch, and all in the same plane; polyps arranged in a thickly set row on one side of branchlets.

PLEUROGORGIA MILITARIS, new species.

Plate XLVI, fig. 8; plate LI, fig. 2.

Colony incomplete, consisting of a straight smooth stem about 112 mm. long, giving off unilateral branches which are 8 mm. apart and all in the same plane. The branches are very slightly curved, but not bent or geniculate; their surface is smooth, and on their upper sides are borne the equidistant polyps which are about 7 mm. apart. On another specimen of the same species the stem bears a row of similarly spaced polyps opposite the branches, each being about one-third the length of an internode below the branch origin on the opposite side.

The polyps are rather slender, cylindrical, 3 mm. high to base of tentacles, the broadest part being beneath the tentacle bases. They stand erect, nearly at right angles to the branch, but are sometimes inclined toward the distal end. The tentacles are long, nonretractile, with conspicuous fringes.

Spicules long, needle-shaped, forming eight very conspicuous longitudinal bands in polyp walls, ending in acute points at tentacle bases. Tentacle spicules few or entirely wanting. The cortex appears smooth, but contains a very thin layer of scale-like spicules with jagged ends, longitudinally disposed.

Color of stem, dark brown with slight iridescence; branches and polyps lighter brown.

Type.—Cat. No. 25334, U.S.N.M., *Albatross* Station 4093, northeast approach to channel between Maui and Molokai, 1171 fathoms.

This was one of the deepest successful hauls made during the cruise.

The name *militaris* was suggested by the stiff regularity of the attitude of the polyps.

Family GORGONELLIDÆ Wright and Studer.

Branched forms with a calcareous axis, thin smooth coenenchyma, and biradially disposed polyps. Spicules small warty double clubs and stellate forms. Longitudinal furrows on the flattened anterior and posterior faces of the stems and larger branches.

Genus VERRUCELLA Milne Edwards.

Colony branched, calyces wart-like, surmounted by an eight-rayed, star-like pseudo-operculum formed of the tentacle bases.

VERRUCELLA BICOLOR, new species.

Plate XLVI, figs. 6, 7.

Colony incomplete, 25 mm. high, consisting of a short basal stem which almost immediately breaks up into two subequal branches, one of which divides dichotomously twice, the other once; one of the resultant branches also divides once; the whole form being flabellate. Another specimen of about the same size divides into three main branches, each of which sends off irregularly disposed branchlets, only the end divisions being dichotomous.

The polyps are distributed on two sides, and sometimes on the back of the branches, leaving an area in front which is almost entirely devoid of polyps, and which is traversed by two or more longitudinal canals which appear superficially as darker longitudinal bands.

Calyces irregularly spaced, averaging about $1\frac{1}{2}$ mm. apart, verruciform, in the shape of low domes when the polyps are retracted, and in the shape of truncated cones when the polyp is expanded. Height about 1 mm.

Spicules, small warty spindles, often curved, sometimes forming stars or double stars, uniformly distributed in the cortex and calycular walls. Just below the tentacle bases is a row of curved transverse spicules like a primitive collaret, and above these two converging spicules form the first of the tentacular spicules which are reinforced by one to three narrow spindles on each tentacle. These form the eight-rayed star-like operculum referred to in the generic definition given by Wright and Studer.

Color.—Coral red in one specimen and orange yellow in the other. The exposed polyps are yellow.

Type.—Cat. No. 25333, U.S.N.M., *Albatross* Station 3982, off Kauai Island, 40–233 fathoms. Red.

Additional locality.—Northeast coast of Maui: Station 4072, 59 fathoms. Yellow.

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EXPLANATION OF PLATES.

The photographic work was done by the author. The drawings of spicules were made by Dr. William B. Bell.

PLATE XLI.

- Fig. 1. *Clavularia spiculicola* Nutting, $\times 4$. The *Clavularia* is seen growing on a sponge spicule.
2. *Clavularia corrugata* Nutting, $\times 4$. Individual polyps above, and a portion of solenium growing over the peculiar woody substance on which the colonies were found below.
3. *Spongodes alexanderi* Nutting, $\times 4$. The specimen was so thick that only portions of it could be brought into focus.
4. *Siphonogorgia collaris* Nutting, $\times 4$.
5. *Pennatula flava* Nutting. Entire colony, reduced about one-third.
6. *Pennatula flava* Nutting. Two of the pinnae, $\times 4$.
7. *Pennatula sanguinea* Nutting. Entire colony, reduced about one-third.
8. *Pennatula sanguinea* Nutting. Two of the pinnae, $\times 4$.
9. *Pennatula pallida* Nutting. Entire colony, reduced about one-third.
10. *Pennatula pallida* Nutting. Two of the leaves, $\times 4$.

PLATE XLII.

- Fig. 1. *Calibelemon symmetricum* Nutting. Entire colonies, slightly reduced.
2. *Calibelemon symmetricum* Nutting. Three polyps, $\times 4$.
3. *Umbellula jordani* Nutting, reduced about one-third.
4. *Umbellula gilberti* Nutting, reduced about one-third.
5. *Cladiscus studeri* Nutting. Front and back views of colony, slightly reduced.
6. *Cladiscus studeri* Nutting. Group of polyps, $\times 4$.
7. *Protoptilum wrighti* Nutting. Portion of colony, $\times 4$.
8. *Trichoptilum attenuatum* Nutting. Portion of colony, $\times 4$.
9. *Umbellula*, species. Slightly magnified.

PLATE XLIII.

- Fig. 1. *Ceratoisis flabellum* Nutting. Portion of colony, $\times 4$.
2. *Ceratoisis grandis* Nutting. Individual polyps, $\times 4$.
3. *Amphilaphis biserialis* Nutting. Portion of a colony, $\times 2$.
4. *Caligorgia gilberti* Nutting. Portion of a colony, $\times 2$.
5. *Stachyodes bowersi* Nutting. Colony, showing parasitic *Ophiocreas*,
 $\times \frac{1}{2}$.
6. *Stachyodes bowersi*. Portion of branch, $\times 2$.
7. *Stachyodes angularis* Nutting. Portion of branch, $\times 2$.
8. *Calyptrophora versluysi* Nutting. Portions of two branches, $\times 2$.

PLATE XLIV.

- Fig. 1. *Paramuricea hawaiiensis* Nutting. Portions of branches, $\times 3$.
2. *Anthomuricea tenuispina* Nutting. Portion of colony, $\times 2$.
3. *Clematissa tenue* Nutting. Two branches, $\times 2$.
4. *Clematissa alba* Nutting. Portion of branch, $\times 2$.
5. *Menella grandiflora* Nutting. Portion of stem, $\times 2$.
6. *Stenella helminthophora* Nutting. Portions of branch, $\times 3$.
7 and 8. *Stenella helminthophora*. Portions of branches, showing the im-
 mensely enlarged scales which form the arcades under which parasitic
 annelids live.
9. Small portion of branch with scales natural size, $\times 2$.

PLATE XLV.

- Fig. 1. *Echinomuricea brunnea* Nutting. Parts of two branches, $\times 2$.
2. *Cyclomuricea flabellata* Nutting. Distal end of branch, $\times 2$.
3. *Cyclomuricea flabellata* Nutting. Distal part of larger branch, $\times 2$.
4. *Chrysogorgia arborescens* Nutting. Two polyps, $\times 8$.
5. *Lepidogorgia spiralis* Nutting. Portions of colony, $\times 3$.
6. *Lepidogorgia gibbosa* Nutting. Portion of colony, $\times 2$.
7. *Chrysogorgia delicata* Nutting. Portion of colony, $\times 2$.
8. *Chrysogorgia arborescens* Nutting. Part of branch, to show difference in
 size between the normal polyps (above) and abnormally enlarged
 polyp (below).
9. *Chrysogorgia curvata* Versluys. Portion of branch, $\times 2$.

PLATE XLVI.

- Fig. 1. *Chrysogorgia flexilis* (Wright and Studer). Three polyps, $\times 2$.
2. *Chrysogorgia lata* Versluys. Three polyps, $\times 6$.
3. *Chrysogorgia stellata* Nutting. End of branch, $\times 2$.
4. *Iridogorgia bella* Nutting. Ends of branches, $\times 2$.
5. *Iridogorgia superba* Nutting. Parts of branches, $\times 2$.
6. *Verrucella bicolor* Nutting. Part of colony, red phase, $\times 2$.
7. *Verrucella bicolor* Nutting. Part of colony, yellow phase, $\times 2$.
8. *Pleurogorgia militaris* Nutting. Part of branch, $\times 2$.

PLATE XLVII.

- Fig. 1. Spicules of *Clavularia spiculicola* Nutting, $\times 45$.
2. Spicules of *Spongodes alexanderi* Nutting, $\times 45$.

FIG. 3. Spicules of *Ceratoisis flabellum* Nutting, $\times 12$.

4. Spicules of *Amphilaphis biserialis* Nutting, $\times 45$.

5. Spicules of *Stenella helminthophora* Nutting, $\times 30$.

6. Spicules of *Caligorgia gilberti* Nutting, $\times 45$.

PLATE XLVIII.

Fig. 1. Spicules of *Stachyodes angularis* Nutting, $\times 30$.

2. Cortex scales of *Stachyodes bowersi* Nutting, $\times 12$.

3. Spicules of *Paramuricea hawaiiensis* Nutting, $\times 45$.

4. Spicules of *Clematissa alba* Nutting, $\times 45$.

5. Spicules of *Anthomuricea tenuispina* Nutting, $\times 45$.

6. Spicules of *Menella grandiflora* Nutting, $\times 45$.

PLATE XLIX.

Fig. 1. Spicules of *Cyclomuricea flabellata* Nutting, $\times 45$.

2. Spicules of *Clematissa tenue* Nutting, $\times 45$.

3. Spicules of *Ceratoisis grandis* Nutting, $\times 45$.

4. Spicules of *Echinomuricea brunnea* Nutting, $\times 45$.

5. Spicules of *Lepidogorgia gibbosa* Nutting, $\times 45$.

6. Spicules of *Chrysogorgia arborescens* Nutting, $\times 45$.

PLATE L.

Fig. 1. Spicules of *Chrysogorgia elegans* (Verrill), $\times 45$.

2. Spicules of *Iridogorgia superba* Nutting, $\times 45$?

3. Spicules of *Chrysogorgia stellata* Nutting, $\times 60$.

4. Spicules of *Chrysogorgia geniculata* (Wright and Studer), $\times 45$.

5. Spicules of *Chrysogorgia flavescens* Nutting, $\times 5$.

6. Spicules of *Chrysogorgia flexilis* (Wright and Studer), $\times 45$.

PLATE LI.

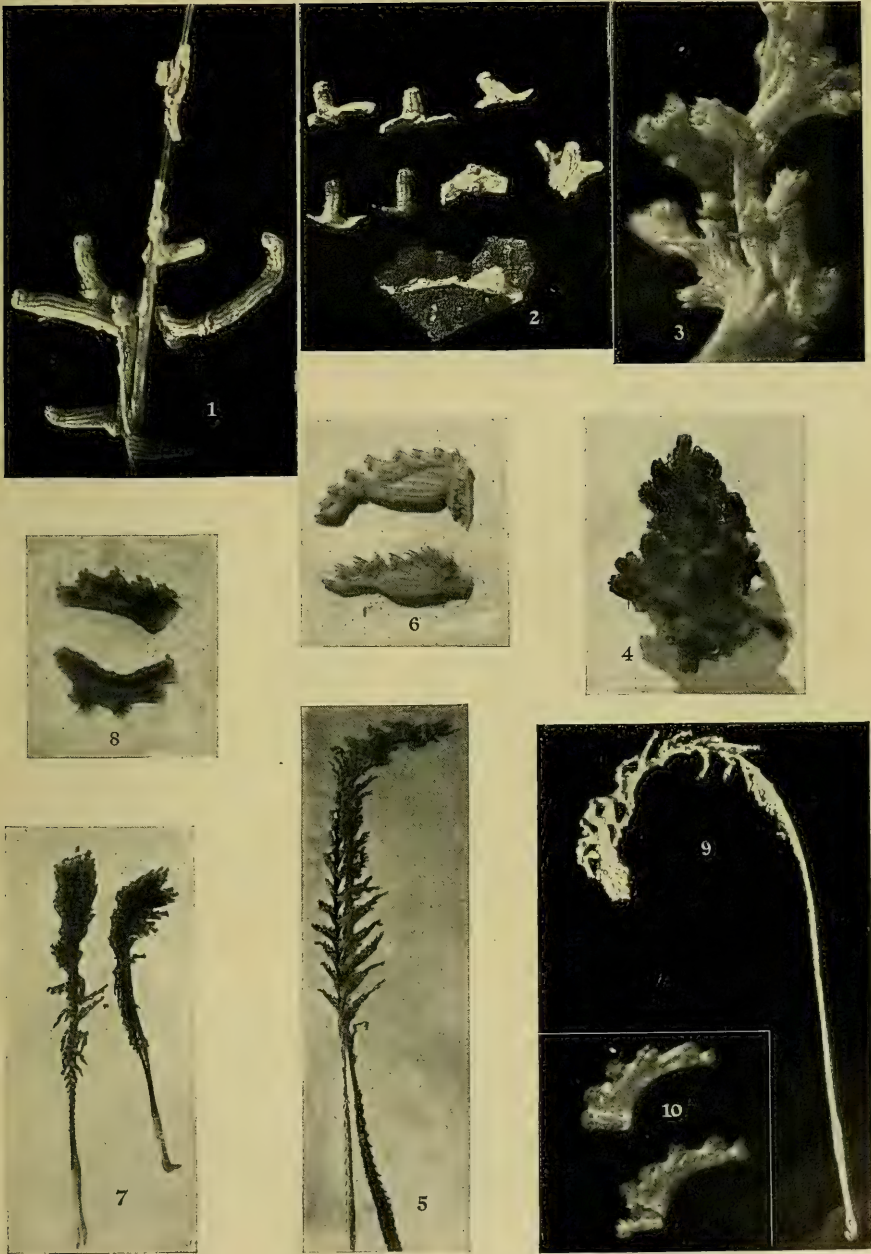
Fig. 1. Spicules of *Iridogorgia bella* Nutting, $\times 45$.

2. Spicules of *Pleurogorgia militaris* Nutting, $\times 45$.

3. Spicules of *Chrysogorgia lata* Versluys, $\times 45$.

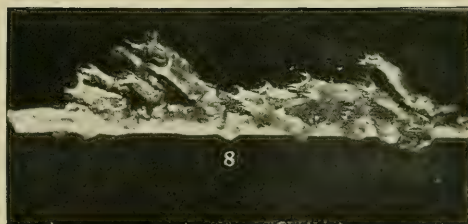
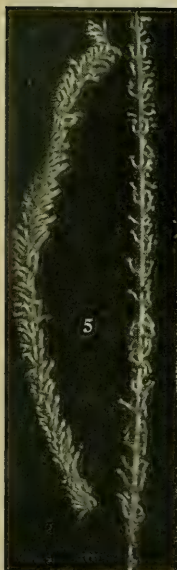
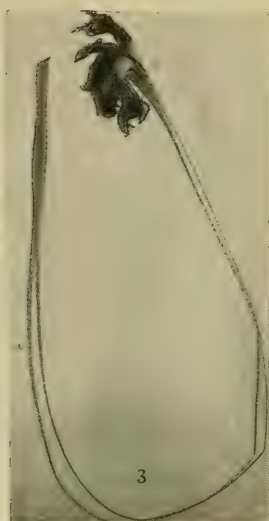
4. Spicules of *Metallogorgia squarrosa* (Wright and Studer), $\times 45$.

5. Spicules of *Metallogorgia melanotrichos* (Wright and Studer), $\times 45$.



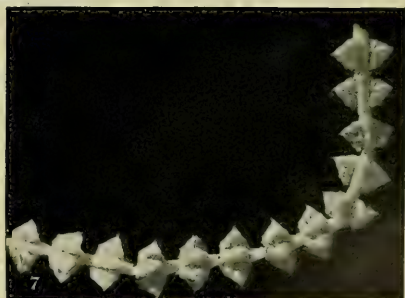
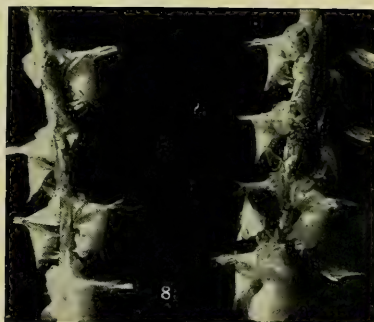
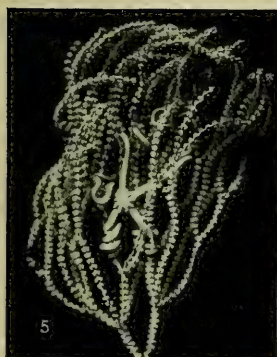
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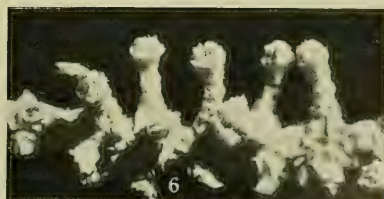
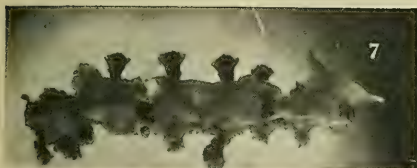
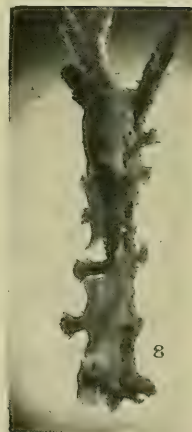
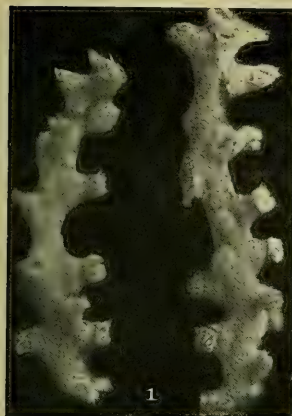
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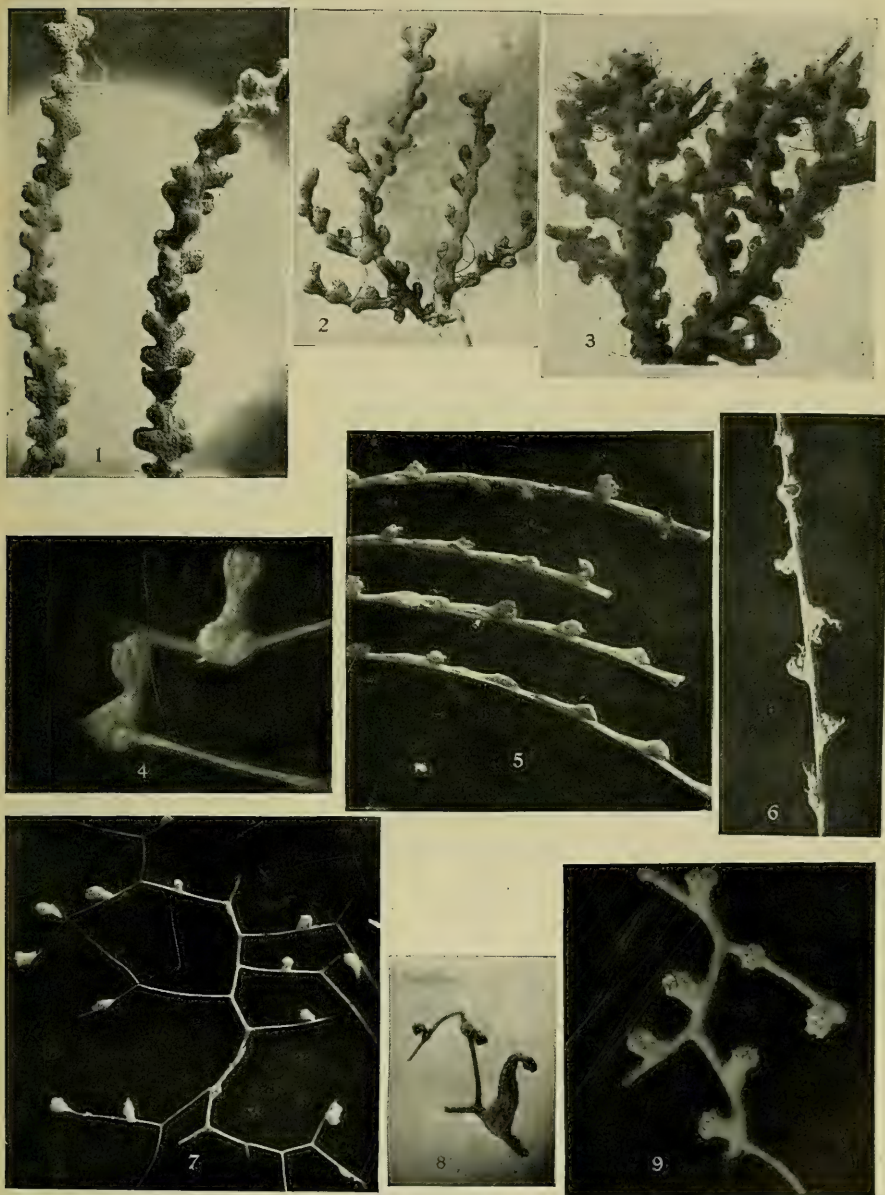
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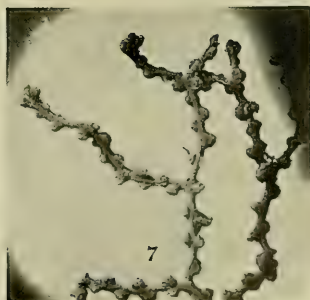
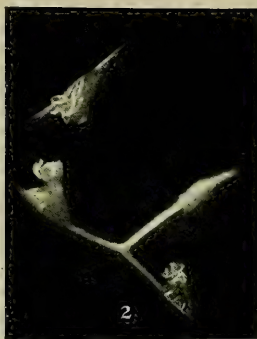
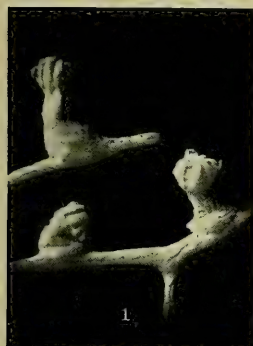
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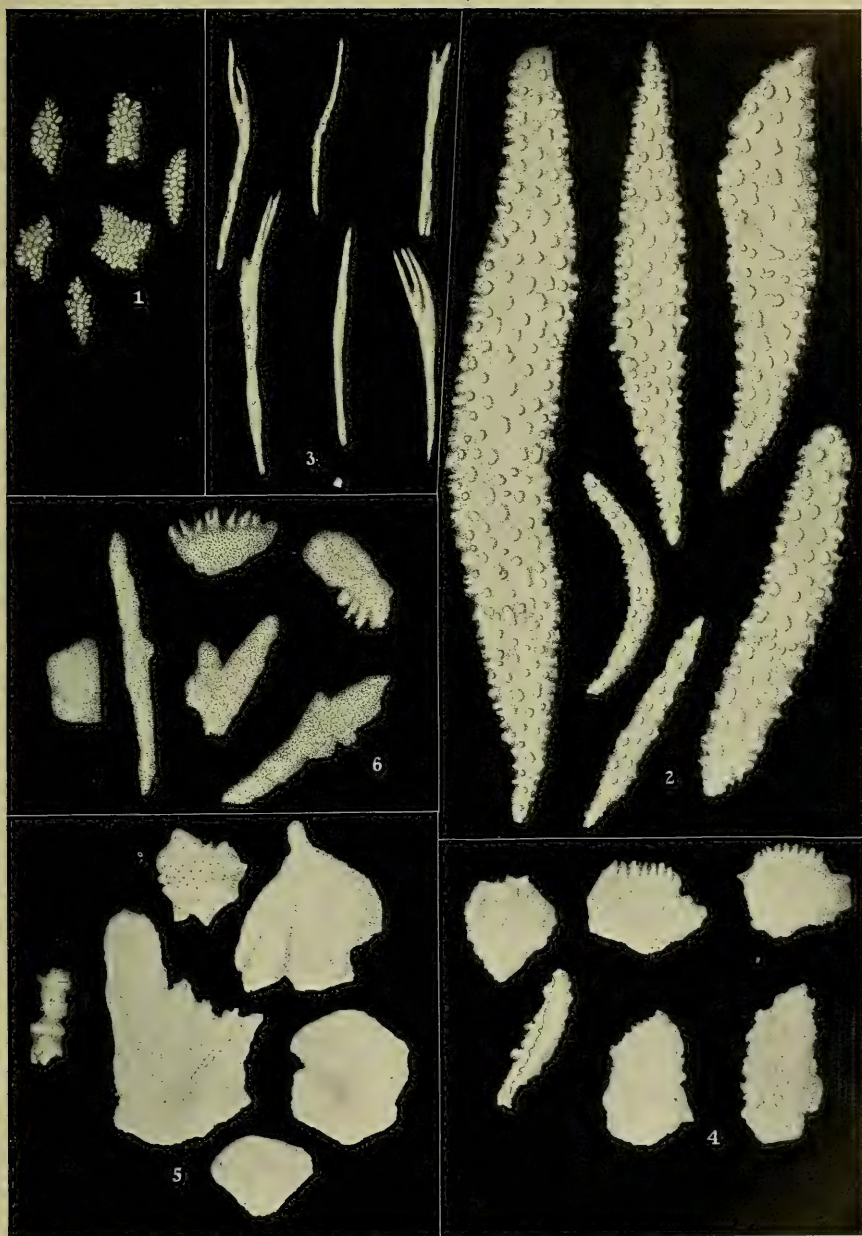
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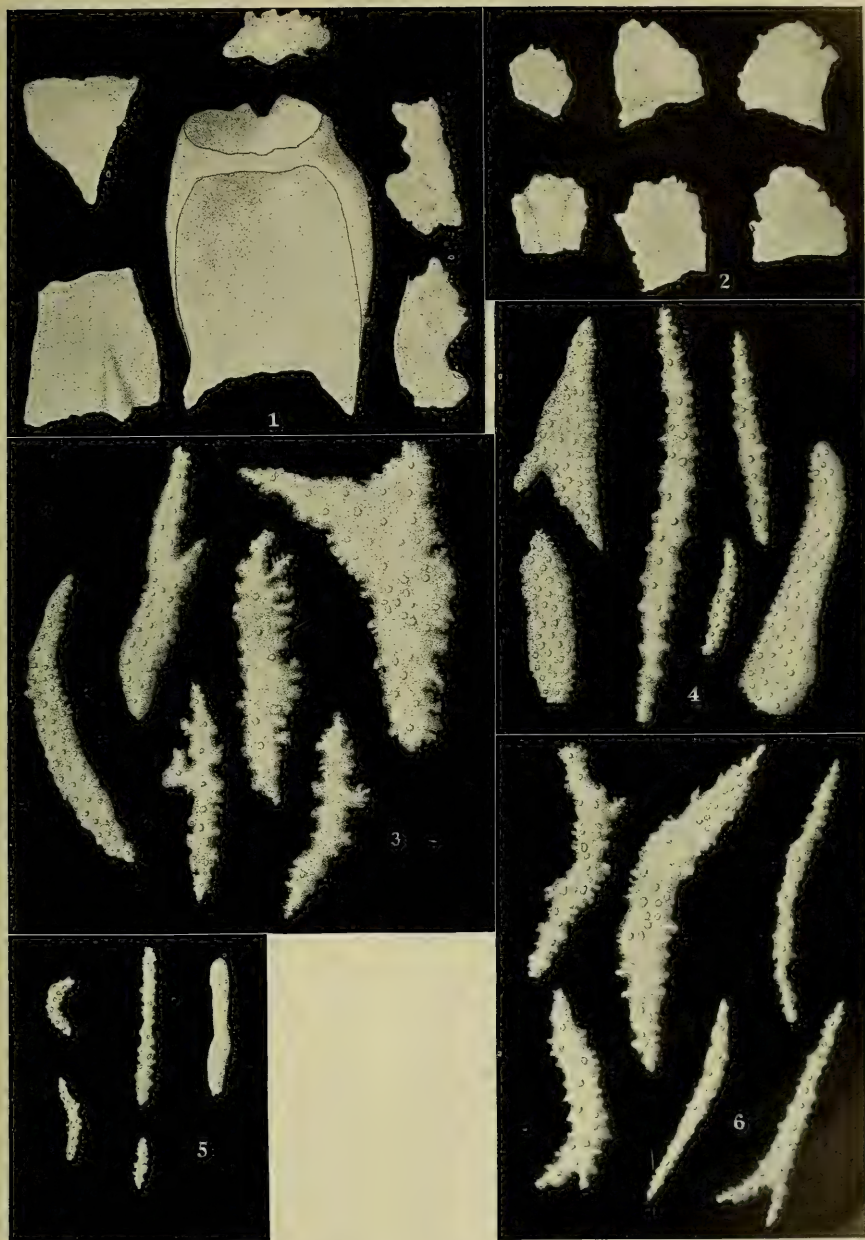
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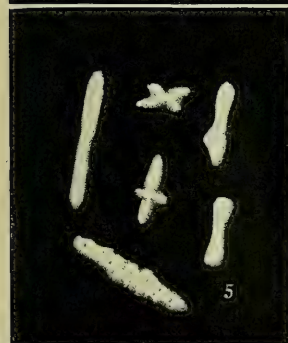
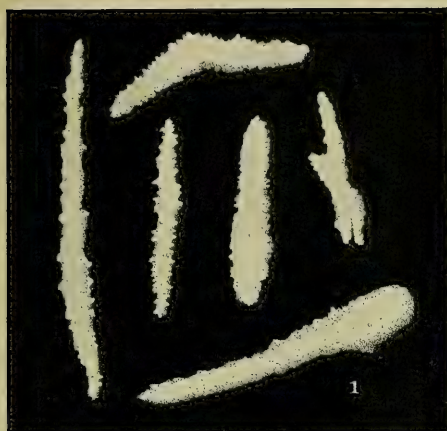
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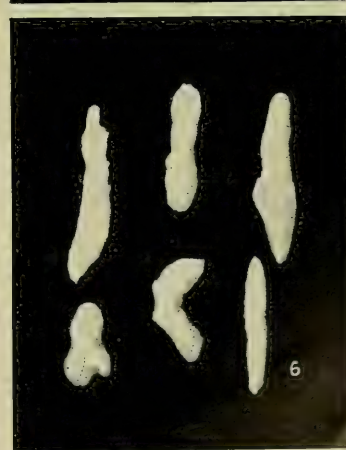
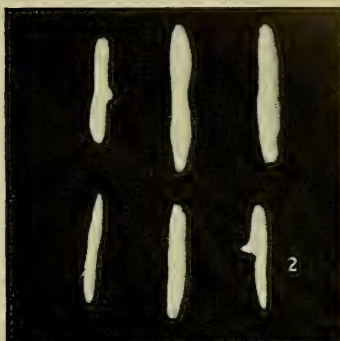
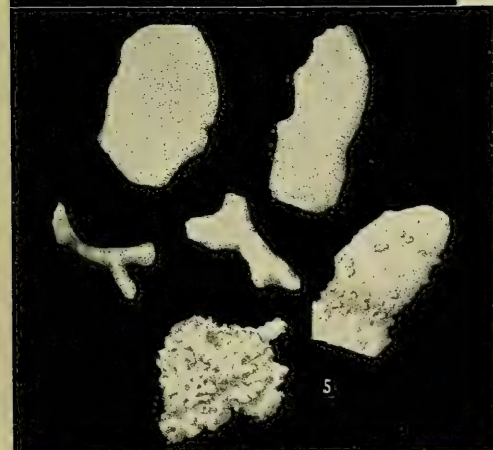
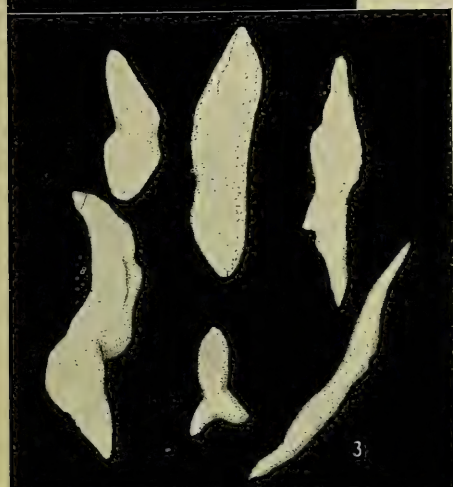
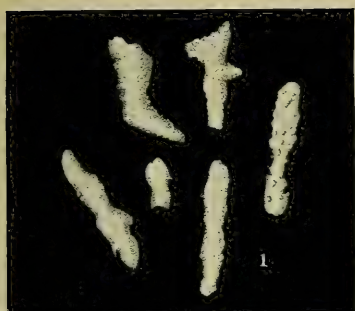
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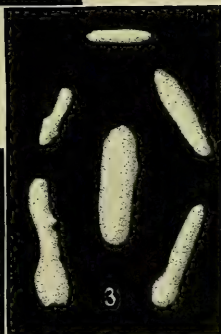
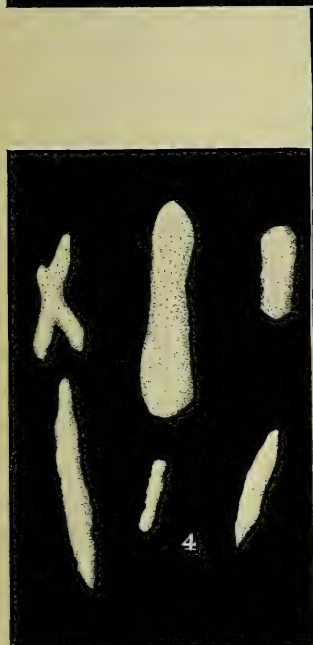
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